Leaders and Followers in Hot IPO Markets

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Abstract

We model the dynamics of going public within an IPO wave. The model predicts that firms with better growth opportunities can find it optimal to go public early and accept underpricing of their issues to signal quality. Data supports this prediction as, on average, early movers underprice their issues significantly more and we show that leaders (early movers with high underpricing) obtain much higher valuations when going public than other IPO firms. Furthermore, after going public, leaders invest significantly more, their sales grow faster, and their profitability remains higher compared to other IPO firms.

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1. Introduction

There is an established literature on the cyclical nature of IPO markets. The time variation in IPO underpricing and volume creates cycles, or waves. The peaks of these cycles are commonly referred to as "hot" (issue) markets, and their troughs are known as "cold" ones. Several papers argue that hot markets are temporary windows of opportunity during which investors are optimistic or the cost of equity is low (see e.g., Helwege and Liang, 2004, Alti, 2006, Pagano et al., 1998). Others offer rational explanations of IPO cycles based on time-varying market conditions (Pástor and Veronesi, 2005) and adverse

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selection (Yung et al., 2008). Lowry (2003) provides evidence that both investor sentiment and firms' demand for capital to invest have explanatory power over the IPO volume.

The papers above do not study the dynamics *within* a hot market. There is a nascent literature that examines timing decisions within an IPO wave. Both theoretical and empirical results in this literature have been conflicting so far. On one hand, the model in Çolak and Günay (2011) predicts that high-quality firms strategically delay their IPOs in a wave. On the other hand, in Chemmanur and He's (2011) model firms that go public earlier in an IPO wave are predicted to have higher productivity and post-IPO profitability. In contrast, Christoffersen et al. (2010) provide some evidence that firms that go public early in an IPO wave are less profitable than those that go public late. Alti (2005) presents a model in which firms that are more likely to discover projects lead hot markets. Their valuations create an information spillover that may lead to a higher volume of IPOs.

The primary objective of this paper is to theoretically and empirically examine the dynamics of going public when a private firm's quality cannot be observed by investors. We develop a simple model of the IPO timing decision which recognizes that some private firms have more valuable growth opportunities than others but credible information on firm quality cannot be conveyed costlessly to investors. The model's outcome implies that high-growth firms can find it optimal to go public early even though there is still uncertainty about the future state of the economy.[1] The model also suggests that going public early is unlikely to be a sufficient signal and high-growth firms have to underprice their issues (as well as going public early) in order to separate themselves from low-growth firms in equilibrium.[2] The

[1] An alternative way of thinking about this outcome is that underwriters, who have a major say on IPO timing and pricing decisions, take high-growth firms public first and set the offer price at a discount. Underwriters have an incentive to act in this way due to reputational concerns (e.g., Beatty and Ritter (1986), see also subsection 2.2). Therefore, the types of equilibrium predicted by the model are expected to be observed in the IPO market even when timing decisions are effectively made by underwriters.

[2] High-growth issuers may find it optimal to accept the underwriter's offer of an issue price that is strictly lower than the price at which competitive investors would be willing to purchase the entire issue in the absence of asymmetric information. Underpricing is therefore used to signal quality of high-growth firms, which low-growth issuers cannot afford to mimic.

model's predictions lead to a number of testable hypotheses: (1) early movers in hot markets experience higher underpricing than other IPO firms on average, (2) leaders (early movers with high underpricing) in hot markets fetch higher IPO valuations than other issuers, (3) leaders grow faster than other IPO firms ex post.

We test these three hypotheses using a large sample of US IPOs. The key empirical findings are as follows. There is a strong positive link between being an early mover in a hot market and underpricing and the link remains robust after controlling for other determinants of underpricing. Leaders have significantly higher valuation multiples calculated at both the offer price and the first-day closing price compared to other IPO firms. Furthermore, following their IPOs, leaders invest significantly more than other IPO firms. Their sales grow faster and profitability remains higher compared to other IPO firms. We consider and control for other factors affecting the timing decision, the underpricing and subsequent performance. We find that, among others, underwriter reputation, first-mover advantage and the absence of suitable comparable firms can have significant effect on these measures, but also that the signaling hypothesis continues to be supported.

The set of theoretical and empirical results presented in this paper is distinct from previous contributions. While the models in Chemmanur and He (2011) and Alti (2005) rely on product market considerations and information spillovers respectively, the model in this paper focuses on the high-growth firms' incentive to signal their type. Our theoretical results disagree with the model in Çolak and Günay (2011), which predicts that high-quality firms may strategically delay their IPOs. Still, their model results in a mixed-strategy equilibrium that also accommodates an outcome where high-quality firms become leaders. The theoretical results in our paper are consistent with more recent dynamic investment models (Morellec and Schürhoff, 2011, Grenadier and Malenko, 2011) which show that high-quality firms may find it optimal to send a signal by accelerating the exercise of their real option. Moreover, in the context of IPO markets, Bustamante (2012) shows that IPO firms can signal quality via timing their issues and an extension of her model suggests that underpricing can be used jointly with timing to signal quality. However, according to Bustamante's interpretation, cold (hot) markets are manifestations of separating (pooling) equilibria, which implies that there will be underpricing in cold markets, but not in hot markets. This implication is contrary to the positive relationship between underpricing and volume documented in the literature (see e.g., Lowry and Schwert, 2002 and Yung et al., 2008). In addition to the pooling-type hot market as in Bustamante's (2012) model, our model predicts a second type of hot market in which high-growth firms go public early and underprice their shares and low-growth firms follow if the state of the economy turns out to be good. In this sense, the signaling model in this paper offers a new explanation for the empirical lead-lag relationship between initial returns and volume beyond explanations based on the partial adjustment phenomenon (Hanley, 1993, Loughran and Ritter, 2002) and information spillovers (Lowry and Schwert, 2002, Alti, 2005).

While treating IPO timing as a signaling tool is recent in the literature, theoretical models that view IPO underpricing as a "money-burning" signal by high-quality issuers have been in existence for a long time (Allen and Faulhaber, 1989, Grinblatt and Hwang, 1989, Welch, 1989, Welch, 1996, see also Bhattacharya, 1979). These models argue that issuers recoup the cost of underpricing in the secondary market when conducting follow-on offerings. However, the empirical link between IPO underpricing and subsequent SEO activity is not very strong (see Jegadeesh et al., 1993, Michaely and Shaw, 1994 and Kennedy et al., 2006).[3] In contrast to these models, the model in this paper suggests that issuers signal their type via timing and underpricing to obtain a higher offer price in the primary market. We provide empirical support for this prediction as leaders fetch higher valuation multiples at the offer price compared to other IPO firms.

Another relevant strand of literature examines whether post-IPO performance is related to underpricing or going public during a hot market. While Jain and Kini (1994) find no

[3]Recently, Francis et al. (2010) have shown that there is a link between foreign IPOs and subsequent SEO activity abroad for firms "domiciled in countries with segmented markets".

association between underpricing and post-IPO operating performance, Zheng and Stangeland (2007) document a positive association.[4] Helwege and Liang (2004) show that hot and cold market IPOs display similar operating performance ex post, and Alti (2006) does not find any difference in the investment rates of hot and cold market IPOs following their issues. Findings related to post-IPO operating performance in this paper complement and extend previous results. We find that leaders (early movers with high underpricing) in hot markets display stronger operating performance ex post. This extends the results in Zheng and Stangeland (2007) who focus on the impact of IPO underpricing, but not of IPO timing. Furthermore, in contrast to leaders, remaining early movers in hot markets (i.e., those with low or no underpricing) grow and invest at similar rates with other IPO firms, which is a finding that complements those in Helwege and Liang (2004) and Alti (2006). Overall, leaders justify the high valuations they receive at the time of their IPOs by exhibiting strong performance ex post (cf. Purnanandam and Swaminathan, 2004).

The remainder of the paper is organized as follows. We present the IPO timing model in Section 2 and develop testable hypotheses based on this model in Section 3. Empirical tests of the hypotheses are performed in Section 4. Section 5 contains extensions and robustness checks. Section 6 concludes.

2. The model

We develop a stylized model of an IPO decision that allows for capturing relevant attributes of economic environment in a parsimonious way. We consider an economy with two dates: $t \in \{0, 1\}$. At $t = 0$, to capture the notion that the future state of the economy is uncertain, investors and firms know only that the state of the economy at $t = 1$ can be good with probability q or bad with probability $1 - q$. The type of a private firm in this economy

[4]The lack of association between underpricing and post-IPO performance in Jain and Kini (1994) is potentially down to the fact that average underpricing is low in their sample period. They report a median underpricing of 1.17% between 1976 and 1988. In comparison, in our sample period, which is between 1975 and 2012, median underpricing is approximately 7%.

is "high growth" with probability p and "low growth" with probability $1-p$. If the economy turns out to be good at $t=1$, the growth opportunities of high- and low-growth firms pay off V_h and V_l respectively, such that $V_h > V_l$.[5] If the economy turns out to be bad, the payoffs of growth opportunities are zero for all firms. All projects require an irreversible investment of I and firms can finance this investment by selling a fraction of their equity to investors during their IPOs. After going public, firms retain fraction α of their equity. The firm's cost of going public (borne by the firm's owners) is c. The IPO market is competitive and investors are uninformed about the firms' quality, such that they cannot distinguish between high- and low-growth firms. For simplicity, the discount rate is zero.

The IPO timing game is illustrated in Figure 1. The economic uncertainty gives firms an incentive to wait. If a firm invests at $t=0$ and the economy turns out to be bad at $t=1$, the payoffs are $-c$ and $-I$ for the firm's owners and investors respectively. The parties can avoid sinking the issuing and investment costs if the firm waits at $t=0$ and goes public at $t=1$ only if the economy is good. In other words, in our model, firms have a real option to go public, which can be kept alive at $t=0$ and exercised at $t=1$ depending on the state of the economy. In the absence of other effects, waiting at $t=0$ would therefore be optimal. However, we show that the asymmetric information about firm quality may give high-growth firms an incentive to move at $t=0$.

[Please insert Figure 1 about here]

2.1. Outcome

The model can lead to three different types of equilibria: (1) a pooling equilibrium: all firms go public at the same date, (2) a separating equilibrium without underpricing: high- and low-growth firms go public at different dates, and (3) a separating equilibrium with

[5] From this point forward, we refer to "private firms" simply as "firms", with the understanding they are private unless otherwise stated.

underpricing: high- and low-growth firms go public at different dates, and high-growth ones send a costly signal to investors by accepting an offer price that implies underpricing.[6]

All firms have an incentive to wait due to the economic uncertainty. At the same time, high-growth firms have an incentive to go public early to distinguish themselves from low-growth firms. Interestingly, high-growth firms' incentive to go public early can make the same action optimal for low-growth firms as well, since low-growth firms can benefit from mimicking high-growth ones. Thus, the type of IPO market equilibrium depends on the tradeoff between firms' incentives for waiting versus moving.

Before moving on to the model's proposition, in order to simplify the notation, we define the expected firm value at $t = 1$ when the economy is good:

$$\overline{V} \equiv pV_h + (1-p)V_l$$

To focus on the economically relevant cases, we impose the following restriction on the cost of going public parameter c:

$$c \geq \frac{pV_h}{(1-p)V_h - \overline{V}} I \tag{1}$$

Proposition 1. *The equilibrium in the IPO market is characterized as follows:*

pooling equilibrium	$0 \leq q \leq \underline{q} \equiv \frac{I+c}{(V_h/\overline{V})I+c}$
separating equilibrium without underpricing	$\underline{q} < q \leq q^* \equiv \frac{(V_l/V_h)I+c}{I+c}$
separating equilibrium with underpricing	$q^* < q \leq \overline{q} \equiv \frac{c}{(pV_h/\overline{V})I+c}$
pooling equilibrium	$\overline{q} < q \leq 1$

In a pooling equilibrium, all firms wait at $t = 0$. At $t = 1$, if the economy is good, they all go public and retain:

$$\alpha_p = 1 - \frac{I}{\overline{V}} \tag{2}$$

[6] Essentially, high-growth issuers are aware that if they go public early, the offer price determined via the efforts of the underwriters and institutional investors will reflect a discount due to valuation uncertainty caused by the asymmetric information between the firms and the market. They are willing to accept the discount, since such an action, which cannot be imitated by low-growth firms, sends a signal to the market about their quality.

In a separating equilibrium (with or without) underpricing, high-growth firms go public at $t = 0$. At $t = 1$, if the economy is good, low-growth firms go public and retain:

$$\alpha_l = 1 - \frac{I}{V_l} < \alpha_p \tag{3}$$

In a separating equilibrium without underpricing, high-growth firms retain:

$$\alpha_h = 1 - \frac{I}{qV_h} > \alpha_p \tag{4}$$

and in a separating equilibrium with underpricing, high-growth firms retain:

$$\alpha_u = \alpha_l + \frac{(1-q)c}{qV_l} > \alpha_p \quad \textit{and} \quad \alpha_u < \alpha_h \tag{5}$$

Proof. See Appendix B ■

The intuition behind Proposition 1 is as follows. If the economy is likely to be bad ($q \leq \underline{q}$), no firm wants to move at $t = 0$, even if it would be valued as a high-growth firm by investors. Consequently, all firms wait at $t = 0$ and go public at $t = 1$ only if the economy is good.[7] α_p reflects the average firm value, such that IPOs are fairly priced on average at $t = 1$. When q exceeds $\underline{q}$, the pooling equilibrium breaks down, since it becomes optimal for high-growth firms to deviate from it.

For $\underline{q} < q \leq q^*$, q is sufficiently high for high-growth firms to move, but not high enough for low-growth firms to mimic high-growth ones. Consequently, high-growth firms lead and low-growth ones follow if the economy turns out to be good. α_h and α_l reflect the true values of high- and low-growth firms, such that each IPO is fairly priced. Note that high-growth firms enjoy a better valuation, since $\alpha_h > \alpha_p$. This is precisely the reason why they move, despite the uncertainty about the value of their growth opportunities. However, as soon as q exceeds q^*, it becomes optimal for low-growth firms to mimic high-growth ones and the separating equilibrium without underpricing breaks down.

When $q^* < q \leq \overline{q}$, high-growth firms still move at $t = 0$, but they now have to underprice their issues just enough in order to deter low-growth firms from mimicking them.

[7] There are no IPOs observed if the economy is bad at $t = 1$.

Consequently, unlike in a separating equilibrium without underpricing, high-growth firms no longer receive a fair valuation (i.e., $\alpha_u < \alpha_h$). But, even though their issues are underpriced, their valuation is still sufficiently higher than the valuation they would have got in a pooling equilibrium (i.e., $\alpha_u > \alpha_p$). Importantly, high-growth firms have to underprice their issues more as q increases, since $\partial\alpha_u/\partial q < 0$. When q exceeds $\overline{q}$, the separating equilibrium with underpricing becomes unsustainable. Above this threshold, high-growth firms prefer pooling with low-growth firms rather than underpricing their issues heavily.

If the economy is likely to be good ($q > \overline{q}$), high-growth firms no longer have an incentive to move at $t = 0$. They realize that low-growth firms would have a strong incentive to mimic them if they moved, and they could only deter low-growth firms by heavy underpricing, which turns out to be a worse option than pooling with low-growth firms at $t = 1$. Consequently, all firms wait at $t = 0$ and go public at $t = 1$ only if the economy is good.[8] α_p reflects the average firm value, such that IPOs are fairly priced on average.[9]

2.2. Discussion

The empirically relevant equilibrium is the separating equilibrium with underpricing as it is the only outcome which predicts that firms may be underpriced *on average* within a certain period. Corollary 1, which follows from Proposition 1, describes when a separating equilibrium with underpricing is more likely to be observed.

Corollary 1. *The IPO market is more likely to be in a separating equilibrium with underpricing when:*

[8]For $0 < q < 1$, pooling at $t = 1$ dominates pooling at $t = 0$. This is because, as long as $q < 1$, there is some economic uncertainty no matter how high q is. This uncertainty lowers expected payoffs of firms if they go public at $t = 0$. For $q = 1$, since there is no economic uncertainty, firms are indifferent between pooling at $t = 0$ and pooling at $t = 1$. Finally, for $q = 0$, it is certain that the economy will be bad at $t = 1$. Consequently, there are no IPOs in this case.

[9]A positive discount rate would render going public early at $t = 0$ less attractive, since firms would have to offer investors a higher fraction of equity to compensate for the fall in the NPV of growth opportunities. An increase in the discount rate of high-growth issuers would make them less willing to go public early and would cause the market to enter into a separating equilibrium at a higher level of q. Similarly, an increase in the discount rate of low-growth issuers would make them less willing to go public early and would reduce the degree of underpricing required to prevent them from mimicking high-growth issuers.

1. *the number of high-growth firms is low relative to the number of low-quality ones (i.e., p is low).*
2. *the quality wedge between the two types of firms is sufficiently large (i.e., V_h/V_l is sufficiently large).*
3. *the future state of economy is uncertain (i.e., q is neither too low nor too high).*

The intuition behind Corollary 1 is as follows. High-growth firms receive a particularly poor valuation in a pooling equilibrium when the first two conditions hold. This gives them a strong incentive to signal quality. However, these two conditions are not sufficient for a separating equilibrium with underpricing. High-growth firms would not like to go public early when the economy is highly likely to be bad. Interestingly, they would not like that if the economy is highly likely to be good either, since this would require heavy underpricing to deter low-growth firms from mimicking. Therefore, economic uncertainty is essential for this type of equilibrium to exist. These three conditions imply that, empirically, the IPO market is most likely to be in a separating equilibrium with underpricing when a smaller proportion of the private firms waiting to go public has much better growth opportunities than the rest, and when there is significant uncertainty about the future state of economy.

In a pooling equilibrium the *average* IPO is fairly priced; and in a separating equilibrium without underpricing, which is empirically much less likely, *each* IPO is fairly priced. On the contrary, in a separating equilibrium with underpricing, IPOs of high-growth firms are underpriced, whereas those of low-growth firms are fairly priced. Therefore, the pooling equilibrium and the separating equilibrium without underpricing fail to explain the periods during which *average* underpricing is quite high empirically. The separating equilibrium with underpricing offers an explanation for the existence of such periods based on the high-growth firms' desire to signal their type. High-growth firms reap the benefits of their costly signal when they go public (and not later, i.e., in the secondary market) by receiving a better valuation compared to the one they would have got in a pooling equilibrium. The model also implies that, when the IPO market is in a separating equilibrium with underpricing, average underpricing should fall sharply when high-growth firms are followed by low-growth ones.

Although we do not explicitly account for the role of an underwriter in the model, the framework itself can be reinterpreted to accommodate the presence of an intermediary in the flotation process. Under such an interpretation, probability p denotes the likelihood of the intermediary having an option to underwrite the IPO of a high-growth firm. The quality of the firm is observed by both the underwriter and the firm itself but not by the market. The cost borne by the intermediary to underwrite the IPO is c_u and its profit is a proportion ϕ of the firm's (expected) payoff from the flotation (e.g., $\phi q \alpha_u V_h$ in a separating equilibrium with underpricing). Then, the model describes the optimal strategy of the underwriter, with $c \equiv c_u/\phi$.[10]

Needless to say, the assumption of the underwriter's profit being proportional to the firm's payoff from the IPO is quite restrictive. However, the intermediary is still likely to have an incentive to choose the flotation strategy that is aligned with the firm's payoff maximization due to reputational concerns. As noted by Beatty and Ritter, 1986, p. 214, "any investment banker who 'cheats' on the underpricing equilibrium by persistently underpricing either by too little or by too much, will be penalized by the marketplace". Even taking the relationship with a particular firm into account, the bank may be interested in being selected as the underwriter of the firm's potential future seasoned equity offerings (SEOs; see also James, 1992).[11]

Finally, the model relies on market participants being sufficiently well informed about the state of the IPO market. How can issuers, underwriters, and investors have insight into the state of the market (hot or cold) and the stage (early or late stage of the hot market) they are in? We argue that past IPO activity and current IPO pipeline (both of which are publicly available, ex ante pieces of information) can help market participants assess the

[10] Alternatively, one could assume that cost c is borne by the firm (the owner) and the underwriter's profit is proportional to the net benefit, e.g., $q\alpha_u V_h - c$.

[11] In a similar vein, Jegadeesh et al., 1993 argue that the firm itself will have incentive to sacrifice some profit at the IPO stage to attract a higher demand at future SEOs.

state of the IPO market with reasonable accuracy.[12] Suppose that the number of IPOs in the previous quarter was low compared to the same quarter of previous years and that the IPO pipeline of the current quarter is weak as well. Also suppose that a number of firms are contemplating an IPO. If a firm starts the IPO process immediately, the market is fully aware that the firm is an early mover, since it is going public at a time when there are few past and scheduled IPOs. If the firm chooses to wait, on the other hand, it understands that the market will treat it as a late mover if some of the remaining firms go public in the meantime. On the contrary, suppose that the number of IPOs in the past quarter was unusually high and the current quarter has already a strong pipeline. If a firm starts the IPO process now, the market knows that the firm is a late mover, since its IPO follows a large number of recent IPOs. Clearly, there are no written rules about exactly when the early stage of a hot market finishes and its late stage starts. Nonetheless, to the extent an IPO firm and its investment bank follow recent IPO activity closely, they can tell reasonably accurately whether starting the IPO process would mean (i) taking a risk by going public at a time when there are few other IPOs around or (ii) coming to the market only after observing a high number of IPOs.

3. Testable hypotheses

In our model, hot markets, which are periods with high IPO volume (i.e., high number of firms going public), emerge when both high- and low-growth firms go public, and there are two types of hot markets. In the first type of hot market, high-growth firms move early (at $t = 0$) whereas low-growth firms move late (at $t = 1$). Furthermore, shares of early movers are underpriced. In the second type of hot market, all firms move simultaneously (at $t = 1$) and shares of high-growth (low-growth) issuers are underpriced (overpriced), but

[12] This type of information is easy to obtain. As an example, Renaissance Capital (a firm that specializes in IPO research) provides detailed data on the monthly number of IPOs (http://renaissancecapital.com/IPOHome/Press/IPOPricings.aspx) as well as an IPO calendar (http://renaissancecapital.com/IPOHome/Calendars/OnDeck.aspx).

average underpricing is zero. In practice, it is not possible for a large number of firms to go public simultaneously on the same day, or even during the same month, since the length of the IPO process varies substantially across firms. Therefore, empirically, there will be early movers and late movers in the second type of hot market as well. However, while early movers are high-growth firms in the first type of hot market, there should be negligible variation in quality across early and late movers of the second type of hot market. Morever, while average underpricing is high at the start of the first type of hot market, it should be theoretically zero (or empirically low) throughout the second type of hot market.

Our model also implies two types of cold markets (periods with no or very few IPOs). The first type of cold market emerges when all firms wait to learn the state of the economy and decide to remain private when the economy turns out to be bad. Recently, such a cold market was observed when the credit crunch hit financial markets in the summer of 2008 causing firms to first delay and then cancel their IPO plans. As a result, the US IPO market was almost entirely shut down for about a year. The second type of cold market emerges when high-growth firms take the risk of going public early, but the economy turns out to be bad and low-growth firms do not follow. While (theoretical) IPO volume is not zero in this case, it is low as low-growth issuers remain private. Interestingly, average underpricing is positive in this type of cold market. However, the level of average underpricing will tend to be much higher in hot markets led by high-growth issuers. This is because, hot markets are more likely to form when the probability that the economy is good (q) is higher, in which case the required level of underpricing that needs to be borne by high-growth firms at $t = 0$ is higher as well (see subsection 2.1). Therefore, IPO firms that underprice their issues substantially are more likely to be followed by other firms resulting in a hot market. This leads us to the first hypothesis (tested in subsection 4.2):

> Hypothesis 1: Early movers in hot markets, on average, experience higher underpricing than other IPO firms.

In the second, or pooling, type of hot market, IPO valuations of high-growth firms are dragged down due to the presence of low-growth firms. Therefore, valuations of both early and late movers reflect the average quality. On the other hand, in the first, or separating, type of hot market, investors rationally believe that early movers that issue underpriced shares are high-growth firms and late movers are low-growth issuers. This suggests that leaders (early movers with high underpricing) should fetch higher valuations when going public than early movers with no (or low) underpricing and than late movers in both types of hot markets. Furthermore, they should also fetch higher valuations than high-growth firms that go public in cold markets. Intuitively, at $t = 0$, a higher probability that the economy is good at $t = 1$ (i.e., a higher q) implies more valuable growth opportunities as well as a higher chance that a hot market will form. As a result, the second hypothesis (tested in subsection 4.3) is formulated as follows.

> Hypothesis 2: Leaders in hot markets fetch higher IPO valuations than other issuers.

The model assumes that investors cannot distinguish high-growth issuers from low-growth issuers ex ante. However, if some IPO firms indeed have more valuable growth opportunities, they should grow faster than other IPO firms ex post. In particular, if leaders in hot markets are high-growth firms signaling quality, their ex-post performance should be in line with their superior growth prospects. On the other hand, while high-growth firms that go public in cold markets also have more valuable growth opportunities than low-growth firms, these opportunities are lost once the state of the economy is revealed as bad. Thus, our final hypothesis (tested in subsection 4.4) is as follows.

> Hypothesis 3: Leaders grow faster than other IPO firms ex post.

Before moving on to describing the data and testing these three hypotheses, we describe how early movers and leaders in hot markets are identified.

3.1. Empirical definition of a leader

We follow the procedure employed in Çolak and Günay (2011) to detect the starting point of hot markets, or "rising IPO cycle"s. First, we obtain data on IPO volume from Jay Ritter's website.[13] Then, we calculate the 4-quarter moving average of IPO volume $MA(4)$. Finally, rising IPO cycles are identified as periods during which $MA(4)$ has risen for at least three quarters in a row.

The procedure yields 12 rising IPO cycles between 1975 and 2012. Seven of them last between five and seven quarters, three of them last three or four quarters, and the remaining two last nine and 14 quarters. We label the first quarter of a rising IPO cycle as $Q = 1$, the second as $Q = 2$, and so on. In our empirical analysis, we define 'early movers' as firms that go public within the first two quarters of a rising IPO cycle and use a binary variable E to distinguish them ($E = 1$) from the remaining firms in the sample ($E = 0$), such that:

$$E = \begin{cases} 1 & Q \leq 2 \\ 0 & otherwise \end{cases} \tag{6}$$

Furthermore, we split the sample into terciles $UP \in \{1, 2, 3\}$ based on underpricing. The bottom ($UP = 1$), middle ($UP = 2$), and top terciles ($UP = 3$) include IPOs with low, medium, and high underpricing respectively. Since the model implies that high-growth firms may have incentives to go public early *and* underprice, we define "leaders" as early movers $E = 1$ that are in the top tercile of the underpricing distribution $UP = 3$. In particular, we define L as follows:

$$L = \begin{cases} 1 & E = 1 \;\&\; UP = 3 \\ 0 & otherwise \end{cases} \tag{7}$$

It is important to note that while hot markets are detected ex post, it is not the case that (when deciding on IPO timing) firms are unaware of their potential position (early or late

[13] http://bear.warrington.ufl.edu/ritter/ipoisr.htm

mover) in a hot market. That is, when high-growth firms are going public, they are aware that a hot market will form if the uncertainty over economic conditions is resolved favorably and that they will be the leaders of that hot market. Similarly, low-growth firms are aware that they are becoming followers in a hot market by going public after high-growth firms and only when the economy is good. The fact that high-growth firms can only learn whether low-growth firms follow them ex post is irrelevant, since it does not affect their IPO timing and underpricing strategies.

4. Tests

4.1. Data

We obtain our IPO data from the Securities Data Company (SDC), financial data from Compustat, and price data from Center for Research in Securities Prices (CRSP).[14] The data on firm foundation years comes from the Field-Ritter dataset.[15] Underwriter reputation rankings are downloaded from Jay Ritter's webpage.[16] We follow the usual sample selection criteria employed in the empirical IPO literature and exclude closed-end funds, REITs, acquisition companies, depository institutions (banks, savings and loans), limited partnerships, American depositary receipts (ADR), unit offers (packages of shares and warrants), best effort issues, and auctions. Furthermore, we focus on firms with price data on CRSP and, like Helwege and Liang (2004), require that trading starts no later than 10 days after the IPO date. After these exclusions, the sample contains 8,160 firm-commitment IPOs that took place between January 1st, 1975 and December 31st, 2012.[17]

[14] We correct the errors in SDC identified by Jay Ritter. The list of these errors is available on his webpage: http://bear.warrington.ufl.edu/ritter/SDC_corrections.pdf.

[15] http://bear.warrington.ufl.edu/ritter/FoundingDates.htm

[16] http://site.warrington.ufl.edu/ritter/ipo-data/

[17] Even though the SDC's coverage of US IPOs starts in 1970, we choose 1975 as the starting point of our sample period. There are several reasons why we make this choice: (1) The SDC's pre-1973 IPO data is incomplete (Gompers and Lerner, 2003), (2) The majority of pre-1975 IPOs have missing financial data in Compustat (Helwege and Liang, 2004, Purnanandam and Swaminathan, 2004), (3) The pre-1973 price data for NASDAQ-listed IPOs is unavailable in CRSP (Lowry, 2003), and (4) the data on foundation years, which we use to calculate firm age is available from 1975 on Jay Ritter's website.

Some papers further restrict their samples to exclude not only some financial firms (closed end funds, REITs, etc.), but all of them with an SIC code between 6000 and 6999 (see e.g., Helwege and Liang, 2004, Alti, 2006, and Bustamante, 2012). Moreover, partial spinoffs and reverse leveraged buyouts are excluded in some studies as well. We retain such firms in our sample, but control for them in our tests. Finally, many papers exclude penny stocks (offer price less than $5), but, like Çolak and Günay (2011), we keep them and control for their presence in the sample as well.

The breakdown of our sample by year is provided in panel A of Table 1. The cyclical nature of IPO activity is apparent. The number of IPOs in a year ranges between 11 and 697 and the average first-day return is as high as 71.30% in 1999 and as low as 0.8% in 1975.[18] Mean first-day return, our proxy of underpricing, is 18.77% over the entire sample period, whereas the median is approximately 7%, suggesting skewness in initial returns. Mean first day returns are slightly lower (higher) when penny stocks (financial firms) are excluded, but the effect of those exclusions is small.

[Please insert Table 1 about here]

In panel B of Table 1, the sample is broken down by timing. We distinguish IPOs that took place during the peak of the Dot-com Bubble (the last quarter of 1999 and the first quarter of 2000) as prior literature documents a 'regime shift' in initial returns (Ljungqvist and Wilhelm, 2003) during the bubble period, which may have been caused by investor overoptimism (Derrien, 2005), or weaker incentives of owners to resist underpricing (Ljungqvist and Wilhelm, 2003). There are 266 IPOs that took place during this period in our sample, which have an average initial return in the region of 100%. In comparison, the average initial return during cold markets is 16.32% in our sample. We also distinguish early movers as firms that are going within the first two quarters of a rising IPO cycle and late movers as

[18] The yearly numbers of IPOs (excluding penny stocks) and the annual figures of average first-day returns (again excluding penny stocks) match very closely with those reported by Jay Ritter in his 'IPO Statistics' document (http://bear.warrington.ufl.edu/ritter/ipodata.htm).

those conducting an IPO during the subsequent quarters of the rising IPO cycle. The model predicts that the highest levels of underpricing during an IPO cycle will be observed at the outset of a hot market. Consistent with this prediction, initial returns are substantially higher for early movers than they are for both late movers and cold market issuers. More specifically, the mean (median) initial return is 22.82% (10%) for early movers, whereas the corresponding figure is 16.32% (6.82%) for cold market issuers and 12.51% (5%) for late movers.

4.2. Do early movers in hot markets underprice more than other IPO firms?

The statistics reported in panel B of Table 1 support the model's prediction that early movers underprice their IPO shares more than other issuers. However, the literature offers several alternative explanations for why IPOs yield positive initial returns and why the market level of initial returns varies over time. Therefore, we investigate whether the pattern observed in panel B of Table 1 still remains once we account for these alternative explanations.

[Please insert Table 2 about here]

Underwriters play a crucial role during the IPO process. They not only have a large say in setting the offer price but also influence the timing of the issue. Carter and Manaster (1990) and Carter et al. (1998) posit a negative relationship between underpricing and underwriter reputation. The presence of a high-prestige underwriter certifies an issuer's quality and such issuers do not need to underprice as much as issuers that are taken public by low-prestige underwriters. If high-prestige banks took public high-growth firms only and low-growth issuers could only hire low-prestige banks, high-growth firms would not need to separate themselves by issuing underpriced shares early in a hot market. To test this idea, we distinguish between IPOs led by high-prestige banks and those led by low-prestige banks. As in Loughran and Ritter (2004), high-prestige (low-prestige) banks are identified as those that have a Carter and Manaster (1990) ranking of greater than or equal to (less than) 8 on a 9-point scale.[19] According to findings in panel A in Table 2, early movers in both categories have a median underpricing of 10% and late movers in the high-prestige (low-prestige) category have a median underpricing of 4.6% (5.5%). Thus, even among IPOs underwritten by high-prestige banks, early movers experience high levels of underpricing. It also appears that the client base of high-prestige underwriters is not limited to high-growth firms. This is consistent with Loughran and Ritter (2004, p. 22) who state that "over time, especially in the internet bubble period, prestigious underwriters relaxed their underwriting standards and took public an increasing number of very young and unprofitable companies."

The model developed in this paper assumes that the value of an IPO firm's growth opportunities is sensitive to the state of the economy. This assumption is particularly valid for high-beta industries, which have a cyclical nature. However, in low-beta industries (e.g., utilities), the value of an issuer's growth opportunities correlates less with the economy. In Appendix A (see also subsection 5.2) we extend the model to allow for an arbitrary level of sensitivity of the growth opportunity value to the state of economy. We obtain that signaling equilibrium with underpricing survives for low-beta firms as well. Data supports this view such that median underpricing is positive and equals 5.2% (7.7%) for IPO firms that belong to an industry with beta less than or equal to (greater than) 1. Moreover, early movers are underpriced more heavily than late movers regardless of whether they are in a low-beta or high-beta industry (see panel B in Table 2).[20]

According to Rock (1986), underpricing is a way of mitigating the winner's curse, which ensures the participation of uninformed investors in the IPO market. Rock's model implies that firms that are subject to higher ex-ante uncertainty experience a higher degree of un-

[19]The rank of the bookrunner or the highest-ranking joint bookrunner is used for classification when there is more than one lead underwriter involved in an IPO.

[20]We estimate industry betas by regressing monthly returns on Fama-French industry portfolios on monthly market returns. We use a 10-year rolling window and work with 49 industry portfolios (see http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_49_ind_port.html for data and definitions).

derpricing (Ritter, 1984, Beatty and Ritter, 1986). A commonly used measure of ex-ante uncertainty is the firm's age at the time of its IPO. Younger firms with limited operational history are more difficult to value, and, thus, their issues are expected to be underpriced more. Consistent with this prediction, average first-day return is 25.31% for firms that go public in less than four years after being founded, whereas it is only 10% for firms that have been operating for more than 16 years (see panel C in Table 2). Like Rock's model, the model presented in Section 2 implies that underpricing will be higher for younger issuers, as they are subject to higher valuation uncertainty compared to more mature issuers for which there is more information available. However, unlike Rock's model, the model in this paper predicts that among the young issuers those that are of high quality will signal their type by issuing underpriced shares at the start of a rising IPO cycle. The results in panel C of Table 2 support this prediction, since the signaling effect is strongest among young issuers. Among issuers that are less than four years old, mean initial return is 34.8% for early movers, but only 15.59% for late movers and 19.83% for cold market issuers. Among issuers that are more than 16 years old, the distribution of initial returns does not vary in an economically significant way across early movers, late movers, and cold market issuers. This makes sense, since mature issuers need not signal their already visible quality.

Benveniste and Spindt (1989) (see also Benveniste and Wilhelm, 1990) argue that book-building works as an information extraction mechanism such that institutional investors truthfully reveal their positive information about an issuer, since underwriters reward them by share allocations and by incorporating positive information into the offer price only partially. The act of partially adjusting the offer price in the primary market is tantamount to underpricing the issue, since the price will fully reflect the positive information once trading commences in the secondary market. Thus, an empirical implication is that initial returns are expected to be higher (lower) when the offer price is adjusted upwards (downwards) (Hanley, 1993). The partial adjustment phenomenon is observed in our sample, as the average initial return is less than 4% when the offer price is set below the initial price range, but it exceeds 50% when the offer price is fixed above the initial price range (see panel D in Table 2). If the partial adjustment phenomenon is the primary driver of positive initial returns, when the offer price is set above the initial price range, the average initial return should be equally high for early movers and late movers. This is not the case in our sample, such that the average initial return exceeds 50% for early movers, but remains below 30% for late movers, conditional on the offer price being above the maximum price of the initial price range. This suggests that the partial adjustment phenomenon cannot fully account for the fact that early movers experience higher initial returns on average than other issuers in the US IPO market.

Bradley and Jordan (2002, p. 597) note that "only the shares actually sold to the public in the IPO are ever undervalued. The shares retained by insiders are valued at market." This reasoning, which is based on insiders' wealth losses due to underpricing (Habib and Ljungqvist, 2001 and Loughran and Ritter, 2002), implies that pre-IPO owners care less about reducing underpricing when they are not selling too many shares in the IPO, or when the share overhang defined as the ratio of retained shares to the public float is high. Indeed, the average initial returns for IPOs with high and low share overhang are 33.72% and 12.02% respectively (see panel E in Table 2). However, the link between insiders' wealth losses and underpricing does not account for the higher initial returns experienced by early movers, since this signaling effect is still present among issuers with similar levels of overhang. For example, among medium-overhang (high-overhang) issuers, median initial return is 10% (21.02%) for early movers, whereas it is only 5% (5.58%) for late movers.

Another strand of the literature argues that positive initial returns are driven by investor sentiment and they reflect overpricing rather than underpricing (Derrien, 2005, Cornelli et al., 2006). This line of thought implies that pre-IPO market movements will have predictive power on initial returns, as offer prices partially adjust to not only private information (as argued by Benveniste and Spindt, 1989) but also public information (Loughran and Ritter, 2002). This implication can be observed in our sample. Average initial return is 16.43%

when the pre-IPO market return is negative, whereas it is 21.94% when the market runs up more than 2% (see panel F in Table 2). Yet, investor sentiment does not eradicate the signaling effect predicted by our model, which is observed regardless of whether the pre-IPO market return is negative, mildly positive, or highly positive. For example, among firms that went public following a negative market movement, median initial return is 7.81% for early movers, whereas it is 3.57%, or less than half, for late movers.

Overall, the results in Table 2 indicate that the cross-sectional pattern in initial returns observed in panel B of Table 1 does not vanish when challenged one at a time with alternative explanations of initial returns. What remains to be done is to investigate whether this pattern, which is consistent with the model, still remains robust in a multivariate setup where alternative explanations are taken into account at the same time. Table 3 reports output of OLS regression models, where the dependent variable is our proxy of underpricing R, the percentage change between the offer price and the first trading day closing price. The main variable of interest E, which is defined in Equation (6), distinguishes early movers in hot markets from other IPO firms.

[Please insert Table 3 about here]

In Model (1), we regress R on E and control for penny stocks ($Penny$), partial spinoffs (*Spinoff*), reverse LBOs ($RLBO$), and financial firms ($Financial$). As expected, penny stocks are underpriced more due to their speculative nature. Partial spinoffs, reverse LBOs, and financial firms, all of which are typically more mature/transparent businesses at the time of going public, are underpriced less. In Model (2), we add two proxies of ex-ante uncertainty. The first one is Age, the difference between the IPO year and the foundation year. The second one is $Tech$, a dummy variable that is equal to one if the issuer is a technology firm. The list of four digit SIC codes provided by Loughran and Ritter (2004) is used to identify technology firms. Consistent with the winner's curse hypothesis, initial return falls with age and is higher when the issuer is a technology firm. Next, we add two proxies of sentiment in Model (3). We control for market movements over the 15 trading days before the IPO and also for the IPOs that took place during the peak of the Dot-com Bubble. Both variables have significant coefficients with their predicted signs. Share overhang is added in Model (4) and price revision in Model (5), both of which have positive coefficients as expected. In Model (6), we add a dummy variable that indicates whether the issuer is backed by venture capital or not. Megginson and Weiss (1991) argue that the certification role of venture capital helps lower initial returns. On the other hand, Bradley and Jordan (2002) find that VC-backed IPOs are underpriced more, but most of the effect is driven by the fact that such IPOs are more concentrated in (technology-based) industries associated with higher underpricing. Consistent with the findings of Bradley and Jordan (2002), the VC dummy in Model (6) has a positive coefficient, but the variable does not increase the explanatory power of the model substantially. In Model (7), industry beta β_{ind} is added and has a positive coefficient, consistent with the results of the univariate analysis.

Most importantly, the coefficient of our main variable of interest E is always positive and statistically significant across Models (1) to (7) at the either 1% level. This finding remains robust if we restrict the sample to firms taken public by low-prestige underwriters only (Model (8)) or to those taken underwritten by high-prestige underwriters only (Model (9)). Overall, there is clear evidence that the signaling effect is distinct from other factors known to explain initial returns. This lends support to the hypothesis that early movers experience higher underpricing than other IPO firms.

4.3. Do investors value leaders more highly?

According to the model in Section 2, leaders (early movers with high underpricing) in hot markets are high-growth firms. High-growth firms follow the two-part strategy of going public early and underpricing only if they receive a valuation (i.e., offer price) that is higher than what they would have received in a pooling equilibrium. Furthermore, since the types of firms are revealed in a separating equilibrium, first-day closing prices will reflect fair values of leaders. Therefore, the model predicts that investors will value leaders more highly than other IPO firms at both the offer price and the first-day closing price.

In order to test this hypothesis, we compare valuations between IPO firms and seasoned firms. We also investigate whether any valuation premium with respect to seasoned firms is higher for leaders compared to other IPO firms. Put another way, an IPO firm is expected to be valued more highly than a comparable seasoned firm to the extent that the former has better growth opportunities; the model predicts that the difference in valuations is greater when the IPO firm is a leader, since IPO firms with more valuable projects tend to become leaders. Our approach for identifying suitable matching firms is similar to approaches used in Purnanandam and Swaminathan (2004) and Kim and Ritter (1999). We start by narrowing down the IPO sample to nonfinancial firms (SIC codes outside the 6000-7000 range) that have an offer price of at least \$5 and that have positive sales and EBITDA in the fiscal year prior to the IPO. There are 4,548 IPO firms in the sample that satisfy these criteria. For each of these IPO firms, the initial matching pool consists of public firms that have ordinary common shares (CRSP sharecodes 10 or 11) listed for at least 36 months at the time of the IPO firm's month of listing, that are in the same industry as the IPO firm (based on the 3-digit SIC code), and that have (i) sales no less than half and no more than double of the IPO firm, (ii) positive EBITDA, and (iii) a stock price of at least \$5 during the same fiscal year that precedes the IPO.

Following this matching procedure, we obtain at least one matching firm for 3,500 IPO firms.[21] Conditional on having at least one matching firm, the median (mean) number of matching firms in the initial matching pool is 5 (8.86) up to a maximum of 75 matches. From this initial matching pool of firms with the same industry and similar size in terms of sales, we pick either the firm that has the closest sales or the one that has the closest EBITDA profit margin. The former technique yields a perfect match on the 3-digit SIC industry and

[21] IPO firms are typically smaller than seasoned firms. Therefore, there are no matches for some of the smallest IPOs that belong to industries with not many firms publicly listed.

the best match on size, whereas the latter yields a perfect match on the 3-digit SIC industry and close matches on size and profitability.

We follow Purnanandam and Swaminathan (2004) and define three different price-to-value ratios:

$$P/Sales = \left(\frac{P^{ipo} \times S^{ipo}}{Sales^{ipo}_{-1}}\right) \div \left(\frac{P^{m} \times S^{m}}{Sales^{m}_{-1}}\right) \quad (8)$$

$$P/EBITDA = \left(\frac{P^{ipo} \times S^{ipo}}{EBITDA^{ipo}_{-1}}\right) \div \left(\frac{P^{m} \times S^{m}}{EBITDA^{m}_{-1}}\right) \quad (9)$$

$$P/Earnings = \left(\frac{P^{ipo} \times S^{ipo}}{Earnings^{ipo}_{-1}}\right) \div \left(\frac{P^{m} \times S^{m}}{Earnings^{m}_{-1}}\right) \quad (10)$$

where P^{ipo} is either the offer price or the first-day closing price of the IPO firm, P^m is the market price of the matching firm on the IPO firm's first day of trading, S^{ipo} (S^m) is the number of shares outstanding for the IPO (matching) firm on the first day of trading, $Sales$ is net sales, $EBITDA$ is earnings before interest, taxes, depreciation, and amortization, and $Earnings$ is income before extraordinary items.[22] The subscript -1 indicates that the figures come from the fiscal year that precedes the fiscal year in which the IPO took place. When calculating $P/Earnings$, both the IPO sample and the matching pool is further restricted to firms with positive $Earnings$ in year -1. The superscripts ipo and m are used to distinguish between IPO firms and matching firms.

If IPO firms are on average valued at the same level as matching seasoned firms, then the distributions of price-to-value ratios will center around the value of one. Panels A to C in Table 4 present the distributions of price-to-value ratios of IPO firms relative to matched non-IPO firms estimated at both the offer price and the first-day closing price. In general,

[22] The number of shares outstanding are mainly obtained from CRSP. However, CRSP is typically inaccurate when the IPO firm has multiple classes of shares outstanding (see the discussion on Jay Ritter's website: http://bear.warrington.ufl.edu/ritter/SDC_corrections.pdf). In such cases, we obtain the number of shares outstanding from the SDC.

IPO firms are valued more highly than comparable seasoned firms at the offer price.[23] The valuation premium is even higher at the first-day closing price, since IPOs tend to yield positive initial returns. Not surprisingly, IPOs that took place during the peak of the Dot-com Bubble have much higher price-to-value ratios compared to other IPOs, which can be explained by market sentiment for internet and tech stocks at the time. Most importantly, while IPOs fetch a valuation premium in general, the premium is significantly higher for leaders compared to other hot market issuers and cold market issuers. For all three types of price-to-value ratios, for both types of matching techniques, and both at the offer price and the first-day closing price, Wilcoxon rank sum tests suggest that distributions of price-to-value ratios tend to have higher values for leaders. The differences are statistically significant at the 1% level. They are economically significant as well. For example, in terms of $P/Sales$ and size and profitability matching, the median valuation premium of leaders exceeds that of late movers by $2.40 - 1.49 = 0.91$ (or approximately 90 percentage points) at the offer price and by $3.09 - 1.63 = 1.46$ (or 146 percentage points) at the first-day closing price. This difference is interpreted as a reflection of superior growth opportunities of leaders predicted by the model in Section 2.

[Please insert Table 4 about here]

The results in Panels A to C of Table 4 exclude firms with negative EBITDA at the time of going public to ensure comparability of results with those in Purnanandam and Swaminathan (2004) and Kim and Ritter (1999). However, starting in 1990s, it has become increasingly common for firms to go public before reaching profitability (Jain et al., 2008). Moreover, Aggarwal et al. (2009), who examine the "new economy period" (1997-2001), highlight that negative earnings can proxy for growth opportunities (cf. Bartov et al., 2002).

[23] The medians of price-to-value ratios estimated at the offer price in Table 4 are very close to those reported in Purnanandam and Swaminathan (2004). For example, if we take size and profitability matching, the median $P/Sales$, $P/EBITDA$, and $P/Earnings$ for all the matched IPO firms are 1.61, 1.53, and 1.45 respectively. In comparison, Purnanandam and Swaminathan report 1.54, 1.49, and 1.54 for the price-to-value ratios calculated based on price-to-sales, price-to-EBITDA, and price-to-earnings multiples respectively.

Furthermore, the model in Section 2 is centered around the idea that investors cannot observe ex-ante growth potential, and younger issuers that are not profitable are harder to value. For these reasons, we enlarge the sample to include unprofitable IPO firms. In particular, in year -1, we continue to require that both IPO firms and matching firms have positive sales, but relax the restriction of positive EBITDA. The sample size increases from 3,500 to 4,689 IPOs as a result. The multiples $P/EBITDA$ and $P/Earnings$ are no longer useful as they require positive EBITDA and earnings, respectively. Thus, we rely on $P/Sales$, which can still be used as a valuation multiple when the issuer is not yet profitable. The results based on the sample that includes unprofitable IPOs (panel D) are consistent with those based on the sample with profitable IPOs only (panel A), such that leaders command a significant valuation premium compared to early movers with low/no underpricing, late movers, and cold market issuers.

The analysis based on comparing price-to-value ratios across leaders and other IPOs does not control for firm characteristics that can explain the valuation premium of leaders. We address this issue by running OLS regression models which include covariates that are value relevant. The covariates included in the models are as follows. As proxies for size and age, we include $Sales_{-1}$ (the figures are adjusted for inflation) and Age. Smaller/younger issuers are more likely to be at the start of their life cycles and, thus, are more likely to have valuable growth opportunities than larger/older issuers. Therefore, we expect a negative relationship between the price-to-value ratios and size/age. $Debt_{-1}$ is defined as long-term debt as a percentage of total assets and proxies for leverage. An IPO firm may obtain a lower offer price if it is going public to reduce long-term debt rather than invest in growth opportunities. $CapX_{-1}$, capital expenditures as a percentage of total assets, is expected to be positively related to valuation premiums to the extent firms that invest more before going public will use IPO proceeds to continue investing at higher rates after going public. Jain and Kini (1995) document that post-IPO operating performance is markedly better for VC-backed IPO firms compared to a matching sample of IPO firms without VC backing. This implies that investors are expected to value VC-backed IPOs more than others. We control for the presence of VC backing with the dummy variable VC. We also add $Tech$ as a covariate, since the value of technology IPOs tends to rely to a larger extent on growth opportunities rather than assets in place and technology IPOs can command a valuation premium as a result. If the majority of shares sold during an IPO are secondary (existing) shares rather than primary (new) shares, this may imply that the main reason why the issuer is going public is not raising proceeds for financing growth projects, but giving pre-IPO owners a chance to liquidate their share holdings. Pre-IPO owners can signal to the market that their firm's intention for going public is to raise proceeds for investments by not selling their existing shares in the IPO (Leland and Pyle, 1977). Therefore, we include the number of secondary shares sold as a percentage of the number of total shares sold $\%Sec$ as an explanatory variable. Finally, we include a dummy variable *Bubble* to account for unusually high valuations of (internet) IPOs during the bubble period. All accounting variables are based on figures in year -1, the fiscal year that precedes the IPO.

Table 5 reports the results of tests based on OLS regression models. We focus on the case when price-to-value ratios are calculated by industry, size, and profitability matching as described earlier, but the results are very similar if the matching firm is selected on the basis of industry and size only. In panels A and B, price-to-value ratios are calculated at the offer price and the first-day closing price respectively. In panel B, in order to save space, we only report the coefficient of L, the main variable of interest. As expected, price-to-value ratios are negatively related to size, age, and leverage and positively related to capital expenditures and VC backing. They are higher when the issuer is a technology firm. They have a negative relationship with $\%Sec$ as expected, but the relationship is not statistically significant, except in the case of $P/EBITDA$. The coefficient of *Bubble* has the predicted sign as well and is statistically significant at the 1% level across all models but one. Finally, across the models and regardless of whether the offer price or the first-day closing price is used to calculate price-to-value ratios, L has positive coefficients that are statistically significant at the 1% or

5% level. This effect is present among IPOs underwritten by high-prestige banks ($UW = 1$) as well as those underwritten by low-prestige banks ($UW = 0$). Overall, leaders are valued more highly than other issuers even after controlling for the factors that can explain the variation in valuation premiums of IPO firms. This finding can be explained by the model's prediction that investors rationally believe leaders are high-growth firms.

[Please insert Table 5 about here]

4.4. Do leaders grow faster than other IPO firms ex post?

We have so far presented evidence that IPOs of early movers in hot markets are underpriced more on average (subsection 4.2) and that among the early movers those with the highest levels of underpricing (i.e., leaders) fetch higher valuations compared to other IPOs (subsection 4.3). What remains to be done is to investigate whether the post-IPO growth of leaders is consistent with their high valuations relative to both seasoned firms and other IPO firms. In particular, we expect leaders to invest more, their businesses to grow faster and their profitability to remain higher compared to other IPO firms. Therefore, we examine post-IPO growth in capital expenditures and sales and post-IPO change in operating return on assets. The variable definitions follow from Jain and Kini (1994). In particular, $\Delta CapX_y$ is the percentage growth in capital expenditures between fiscal years -1 and y. Similarly, $\Delta Sales_y$ is the percentage growth in net sales between fiscal years -1 and y. Finally, $\Delta Prof_y$ is the change in the level of EBITDA as a percentage of total assets between fiscal years -1 and y.

As in subsection 4.3, we focus on nonfinancial IPOs that have a minimum offer price of $5 and that have positive sales in year -1. We keep IPOs with negative EBITDA in year -1 in the sample, since some of the fastest growing IPO firms ex post are likely to be in this group. We match each IPO with a seasoned firm on the basis of industry, size, and profitability following the approach described in subsection 4.3. We eliminate a match if its operating performance is unknown (for example due to delisting) in a particular fiscal year, while the IPO firm's operating performance is observed during the same fiscal year. In such cases, we use the next available matching firm. After matching IPO firms with seasoned firms, for each pair of firms, we subtract the seasoned firm's growth rate from the IPO firm's growth rate to adjust the latter's operating performance for industry, size, and profitability.

Median values of post-IPO operating performance variables are reported in panel A of Table 6. The figures are broadly similar to median industry-adjusted changes reported in Jain and Kini (1994). Median adjusted sales growth rate between years -1 and 1, 2, and 3 are 37.49%, 56.78%, and 75.02% in our sample and the corresponding rates reported by Jain and Kini are 38.70%, 60.97%, and 80.67% respectively. In terms of capital expenditures, rates are close between years -1 and 1, but they are smaller in our sample between years -1 and 2 and years -1 and 3. Finally, the adjusted change in the level of operating return on assets is negative in years 1, 2, and 3 relative to year -1 in both our study and Jain and Kini's study. While the changes in the level of operating return are less negative in our full sample period, they become very similar to those reported by Jain and Kini if we drop IPOs after 1988 (the year when the sample period of Jain and Kini ends). Overall, these median adjusted rates suggest that IPO firms exhibit faster growth in both sales and capital expenditures compared to matching firms in the same industry. However, IPO firms perform worse compared to seasoned ones in terms of profitability. The post-IPO drop in profitability is reported in Mikkelson et al. (1997), Pagano et al. (1998), and Alti (2006) as well.

[Please insert Table 6 about here]

The figures presented in panel A of Table 6 provide clear evidence that leaders experience faster growth in sales up to three years after going public and in capital expenditures up to two years after going public in comparison to early movers with low underpricing in hot markets, late movers in hot markets, and cold market issuers. Furthermore, there is evidence that leaders suffer less from the post-IPO drop in profitability compared to the same groups of issuers. Wilcoxon rank sum tests suggest that the distribution of the change in the level of operating return on assets has significantly higher values for leaders in all periods except the one between years -1 and 2.

In panel A of Table 6, a steady drop in the number of observations is observed when moving from the period between years -1 and 0 to the one between years -1 and 3. This is due to delisting of IPO firms for various reasons such as mergers and acquisitions, liquidation, or inability to meet listing rules. If delistings are not random across the groups we analyze, there may be a survivorship bias in the rates reported for longer horizons. To address this issue, we follow an approach similar to the one used by Helwege and Liang (2004). We focus on the last fiscal year before delisting and roll over growth rates available in that year to subsequent years to make sure the results in panel A of Table 6 are not driven by a survivorship bias. For example, if a firm delists during year 1, we use the rates available in year 0 for years 1, 2, and 3. Operating performance controlling for survivorship bias is reported in panel B of Table 6. Patterns observed in panel A are still present in panel B, suggesting that the superior post-IPO performance of leaders is not mechanically driven by a survivorship bias.

We also investigate post-IPO operating performance in a multivariate framework. In particular, we run OLS regression models by regressing performance variables on L, the dummy for leaders, and the set of covariates used in subsection 4.3. Our findings are reported in panel A of Table 7. Setting the level of sales before the IPO in year -1 as a benchmark, leaders experience faster growth in sales up to three years after going public compared to other IPO firms. Furthermore, up to two years after conducting an IPO, their investments grow faster than other IPO firms. Finally, when we investigate changes in profitability, we observe that L has a positive coefficient up to three years after the IPO and the coefficient is statistically significant at the 1% level in all models but one.

[Please insert Table 7 about here]

In panel B of Table 7, we test whether the results reported in panel A are driven by a survivorship bias. In particular, we roll over the last nonmissing value of post-IPO growth/change variables to subsequent years and rerun the models. To save space we report the coefficient of L only. The findings agree with those in panel A suggesting that the superior post-IPO performance of leaders is not driven by issues related to survivorship.

In summary, the findings in Tables 6 and 7 provide strong evidence that higher valuations of leaders are justified (see subsection 4.3), since leaders display stronger operating performance ex post. This is consistent with the model's prediction that leaders are high-growth firms.

5. Extensions and robustness checks

5.1. Early-mover advantage and the presence of comparables

The model developed in Section 2 emphasizes the costs of going public early in the presence of economic uncertainty. However, there might be benefits of going public early as well. Some firms might be able to reap early-mover advantages if they go public earlier than their industry peers. For example, Schultz and Zaman (2001) provide evidence of Internet firms rushing to go public to grab market share during the Dot-com Bubble. They argue that a concentration of IPOs within a particular industry may be a sign of competitive pressure to gain an early-mover advantage.

In Appendix A, we modify the model of Section 2 to accommodate an early-mover advantage. The predictions of the model remain qualitatively unchanged, but even with a larger set of parameter values being consistent with the separating equilibrium with underpricing. Empirically, we investigate whether the hot markets in the sample period are market wide or industry driven, as gaining the early-mover advantage is likely to be a more dominant motivation in the latter case. To do so, we use the list of 49 industries defined by Fama-French to assess whether early movers of a hot market are drawn from a few or many industries.[24] 32 of these industries are active in the IPO market (> 50 IPOs), such that they account for 95% of the 8,160 IPOs in the sample. Therefore, we focus on 33 industries (32 active industries plus one category for others). Across the 12 hot markets in the sample period, the median number of industries represented in the early stage of a hot market is 25 out of 33. Of course, this statistic could mask industry concentration if there were, say, 100 IPOs from one industry and one IPO from each of the remaining 24 industries. Therefore, we also calculate a normalized Herfindahl index (defined between 0 and 1) for each hot market j as follows: $H_j = (\sum_{i=1}^{33}(n_{ij}/N_j)^2 - 1/33) \div (1 - 1/33)$, where n_{ij} is the number of early movers from industry i in hot market j and N_j is the total number of early movers in hot market j. The median value of H_j is 0.04, which provides clear evidence that no single industry dominates the early stages of a typical hot market. The only hot market that exhibits industry concentration among early movers is the one that coincides with the peak of the Dot-com Bubble 1999-2000. The Herfindahl index for the early stage of this hot market is 0.20, which is the maximum value across the 12 hot markets in the sample and is much higher than the median value of 0.04. In this hot market, only three industries (software, communication, business services) account for two thirds of all early movers. In fact, software industry alone represents 42% of all early movers in that hot market.

As an additional test, we randomly select 50 early movers and 50 late movers whose IPOs are managed by a single book runner who sets the offer price. We then access Investext (via Thomson One) and manually search for the "initiating coverage" reports released by the book runners. The purpose is to investigate whether (i) an early-mover advantage is more frequently highlighted in analyst reports during the predominantly industry driven hot market of 1999-2000, and (ii) an IPO is underpriced more when an early-mover advantage

[24] The list can be accessed here: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library /det_49_ind_port.html.

is highlighted in the analyst report of the book runner.[25]

We find that in 28 out of 100 reports (see panel A in Table 8), the issuer is referred to as having an early/first mover advantage or being/becoming a leader multiple times.[26] Consistent with our expectation, 60% of early movers in the hot market of 1999-2000 are highlighted as early movers or leaders, whereas the corresponding figure is only 20% for the remaining hot markets. Moreover, the mean (median) underpricing is 45% (23.5%) for issuers highlighted as early movers or leaders, while it is only 8.3% (4.2%) for the remaining issuers. This pattern remains robust even if we exclude the hot market that started in 1999 (see the columns titled "All - ex 1999" in Table 8). These results suggest that firms with an early-mover advantage can find it optimal to bear a higher degree of underpricing.

[Please insert Table 8 about here]

An alternative explanation of underpricing is that the investment bank might find it more difficult to value an IPO firm if that firm went public early at a time when there are no or few public firms that are suitable comparables. Thus, we also investigate whether the higher level of underpricing experienced by early movers compared to late movers can be explained by valuation difficulties due to lack of close comparables. To this end, we examine analyst reports with the objective of establishing whether or not finding suitable comparable firms is significantly more challenging for early movers compared to late movers. We find that in 19 reports out of 100 (see panel B in Table 8), analysts who are associated with the book runner that took the firm public mention a difficulty in finding comparables.[27]

[25] Two caveats are in order. First, Investext has a good coverage starting from late 1990s. Therefore, our analysis has to focus on the hot markets that took place towards the end of our sample period. Luckily, there are four hot markets within this period. Second, reports from some brokerage houses (most notably Goldman Sachs) are not available in Investext. However, we still have a good representation of investment banks (more than 20 banks including Morgan Stanley, JP Morgan, Credit Suisse, UBS, Deutsche Bank etc.) in our sample of 100 IPOs.

[26] Examples include: "X remains well positioned for freedom to operate and its lead over Y should keep its first-mover advantage in place for a substantial period", "in our view, the valuation reflects the company's first-mover advantage", and "the company can capitalize on this opportunity to become an industry leader."

[27] A few examples of such mentions are as follows: "There is currently no other publicly traded specialist

Thus, finding suitable peers appears to be a problem for approximately one out of five IPO firms. Out of the 19 IPO firms that lack comparables, 10 are early movers and 9 are late movers. These results suggest that finding suitable peers is a problem for some IPO firms, but early movers do not suffer from this problem at a significantly higher rate compared to late movers. Moreover, underpricing statistics presented in panel B of Table 8 show that early movers experience a higher level of underpricing compared to late movers regardless of whether suitable peers are available or not. In other words, the difference between the average underpricing of early movers and late movers does not vanish after controlling for the difficulty of finding peers.

To summarize, empirical evidence suggests that early movers in hot markets typically come from a spectrum of industries. A notable exception is the hot market of 1999-2000, in which early movers are concentrated in software, communication, and business services industries. It seems early-mover advantages matter more for internet/software firms (see e.g., Schultz and Zaman (2001)). In fact, one of the analyst reports we examine explicitly states that "history suggests that the first mover dominates market share in the software industry." On average, issuers identified as leaders in analyst reports prepared by book runners experience higher underpricing. The willingness of firms that have an early-mover advantage to accept a higher degree of underpricing is consistent with Proposition A.1. We also observe that finding close comparables can be challenging for some IPO firms, but this cannot fully explain the difference in average underpricing between early and late movers.

5.2. Sensitivity to economic conditions

The modeling framework adopted in this paper stipulates that the value of an IPO firm is sensitive to the state of the economy. In particular, the model assumes a zero payoff for the growth opportunities of both high- and low-growth firms in the event of a bad state of

firm on which to base our valuation of X", "finding comparable companies for valuation purposes is difficult given that X is a first-of-its-kind company", "the valuation of X stock presents a number of issues—there are a limited number of publicly traded comparables."

the economy. This is not a necessary assumption. In Appendix A, we outline an extension of the model with a strictly positive payoff, V_b ($< I + c$), in the bad state of the economy. Such a framework has the following attractive interpretation. Some industries (high-beta ones) are highly sensitive to market conditions, whereas others (low-beta ones) are less affected by market swings. A higher positive payoff in the bad state of the economy (equivalent to less severe consequences of economic downturn for firm value) offers a better description of a low-beta industry, whereas a zero payoff in the same state better captures a high-beta industry.

Not unexpectedly, all equilibria types discussed in Section 2 survive. The only differences are in in the levels of critical thresholds that determine when the market moves from one equilibrium to the other (i.e., $\underline{q}$, q^*, and $\overline{q}$). In particular, when V_b becomes strictly positive, all thresholds are lower, which makes intuitive sense – the risk of going public early at $t = 0$ is lower when growth opportunities yield a positive payoff rather than nothing. All in all, signaling equilibrium with underpricing is expected to prevail also for low-beta industries.

Finally, we investigate changes in market conditions over the course of a hot market. According to Proposition A.2, even when the value of an IPO firm's growth are less sensitive to changes in economic conditions (i.e., $V_b > 0$), high-growth firms can still find it optimal to go public early and issue underpriced shares. It is then an empirical question to what extent hot market formation is affected by changes in the economic climate. Changes in economic conditions over the course of a hot market are illustrated in Figure 2. Since it takes several months to complete an IPO (on average four months according to Ritter, 1984), the two quarters that precede a hot market ($Start - 2$ and $Start - 1$) are included as well. Economic conditions are tracked until the quarter during which IPO volume starts to fall ($End + 1$). We observe that early movers file to go public at a time when the stock market volatility (a proxy of economic uncertainty) is high. Late movers file for an IPO when the volatility goes down, and the hot market draws to an end as the volatility begins to rise back. Moreover, late movers enter the market following significant stock market run ups (up to almost 30% over a year), which is not the case for early movers. These patterns suggest a strong link between economic conditions and the IPO market and are consistent with the model's prediction that high-growth firms can find it optimal to go public at a time when economic uncertainty is high, while low-growth firms follow only after observing substantial improvements in economic conditions.

[Please insert Figure 2 about here]

6. Conclusion

The cyclical nature of the IPO market has been recognized since Ibbotson and Jaffe (1975). Changes in market conditions (Pástor and Veronesi, 2005), procyclical adverse selection (Yung et al., 2008), investor sentiment and market timing (Helwege and Liang, 2004, Alti, 2006), or a combination of these factors (Lowry, 2003) are frequently offered as explanations for the emergence of hot and cold IPO markets.

In this paper, we delve deeper and investigate the conditions that cause a firm to (i) move early within an IPO wave and (ii) underprice its issue. We model an economy in which there is information asymmetry about firm quality and uncertainty about the future state of the economy. While the option-like nature of the decision to go public gives all firms an incentive to wait until the uncertainty is resolved, the model shows that firms with better growth opportunities can find it optimal to go public early. Furthermore, the model also shows that going public early is unlikely to be a sufficient signal alone, such that it often needs to be accompanied by underpricing. Investors, then, rationally believe that firms that agree to issue underpriced shares and that are taken public early by underwriters are high-growth firms.

There is strong empirical evidence for the hypotheses that follow from the model. Early movers in hot markets experience higher underpricing than other IPO firms. The result is robust to other determinants of underpricing documented in the prior literature. Furthermore, early movers with high underpricing have higher valuation multiples calculated at the offer price as well as the first-day closing price. This explains why high-growth issuers find it optimal to send the costly signals of going public early and underpricing their shares. Higher valuation multiples of leaders are justified by their strong post-IPO operating performance. The differences in valuation and post-IPO operating performance across leaders and other IPOs remains robust after controlling for value relevant factors and survivorship bias.

The paper adds to the growing literature on the dynamics of going public within an IPO wave by providing theoretical and empirical evidence that hot markets tend to be led by firms with better growth opportunities that use IPO underpricing and timing as signaling tools.

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Appendix A. Model extensions

First, we replace the assumption that there are high-growth and low-growth firms (V_h and V_l) with an alternative assumption that all firms in an industry have an identical growth opportunity that pays V_l if the state of the economy (or the industry) is good at $t = 1$ and that some firms (with probability p) have an early-mover advantage (they can be thought of as Stackelberg leaders), such that *only if* they go public earlier than their competitors, the payoff of their project rises to V_h.

Proposition A.1. *When some firms have an early-mover advantage compared to their competitors, the equilibrium in the IPO market is characterized as follows:*

pooling equilibrium	$0 \leq q \leq \underline{q}' \equiv \frac{I+c}{V_h - V_l + I + c} < \underline{q}$
separating equilibrium without underpricing	$\underline{q}' < q \leq q^{*\prime} \equiv \frac{(V_l/V_h)I+c}{I+c} = q^*$
separating equilibrium with underpricing	$q^{*\prime} < q \leq 1$

In a pooling equilibrium, all firms wait at $t = 0$. At $t = 1$, if the economy is good, they all go public and retain α_l (see Equation (3)). In a separating equilibrium (with or without) underpricing, firms with the early-mover advantage go public at $t = 0$. At $t = 1$, if the economy is good, firms without the early-mover advantage go public and retain α_l (see Equation (3)). In a separating equilibrium without underpricing, high-growth firms retain α_h (see Equation (4)). In a separating equilibrium with underpricing, high-growth firms retain α_u (see Equation (5)).

Proof. See Appendix B ■

When $q \leq \underline{q}'$, there is little chance that the state (of the economy or the industry) will be good at $t = 0$, so even firms with the early-mover advantage prefer to wait. Not surprisingly, firms are willing to bear the risk of going public early at a lower threshold ($\underline{q}' < \underline{q}$) when they have an early-mover advantage. This makes sense, since the risk of going public early is counterbalanced with a potentially higher payoff. When $\underline{q}' < q \leq q^{*\prime}$, firms with the early-mover advantage lead and the remaining firms follow if the state is good at $t = 1$. However, when $q > q^{*\prime}$, the probability of a good state is high enough for firms without the early-mover advantage to try mimic those with the early-mover advantage. Therefore, in order to maintain their early-mover advantage, leaders have to fend off other firms by agreeing to an offer price that implies underpricing. Essentially, this means that benefits of being an early mover overweigh both the risks of going public early and the costs of some amount of dilution.[28] In this scenario, underpricing signals a firm's potential to benefit from an early-mover advantage.

[28] We are grateful to an anonymous reviewer for highlighting this point.

In contrast to Proposition 1, the IPO market does not revert to a pooling equilibrium when q is high. Instead, it remains in a separating equilibrium with underpricing for all q higher than $q^{*\prime}$. This is because firms lose their early-mover advantage if they pool with other firms at $t = 1$, which makes it optimal for them to bear higher levels of underpricing to preserve their advantage. As a result, in a situation in which some firms benefit from being first movers in the IPO market, the separating equilibrium with underpricing becomes more prevalent, and higher levels of underpricing might be observed in equilibrium.

Now, we relax the assumption of a zero payoff in the bad state.

Proposition A.2. *When the payoff in the bad state of economy is V_b instead of zero, the equilibrium in the IPO market is characterized as follows:*

pooling equilibrium	$0 \leq q \leq \underline{q}^b \equiv \frac{I+c-V_b}{(V_h/\overline{V})I+c-V_b} < \underline{q}$
separating equilibrium without underpricing	$\underline{q}^b < q \leq q^{*b} \equiv \frac{(V_l/V_h)I+c-V_b\left(1+\frac{I+c-V_b}{V_h}\right)-\epsilon}{I+c-V_b\left(1+\frac{I+c-V_b}{V_h}\right)} < q^*$
separating equilibrium with underpricing	$q^{*b} < q \leq \overline{q}^b \equiv \frac{c-V_b(1-(1-p)I/\overline{V})}{(pV_h/\overline{V})I+c-V_b(1-(1-p)I/\overline{V})} < \overline{q}$
pooling equilibrium	$\overline{q}^b < q \leq 1$

where $\epsilon \equiv ((V_l/V_h)I + c - V_b)(1 - \sqrt{1 + \frac{4V_bI(V_h-V_l)(I+c-V_b)}{(V_lI+V_hc-V_bV_h)^2}})/2$. *In a pooling equilibrium, all firms wait at $t = 0$. At $t = 1$, if the economy is good, they all go public and retain α_p (see Equation (2)). In a separating equilibrium (with or without) underpricing, high-growth firms go public at $t = 0$. At $t = 1$, if the economy is good, low-growth firms go public and retain α_l (see Equation (3)). In a separating equilibrium without underpricing, high-growth firms retain:*

$$\alpha_h^b = 1 - \frac{I}{qV_h + (1-q)V_b} > \alpha_h \tag{A.1}$$

In a separating equilibrium with underpricing, high-growth firms retain:

$$\alpha_u^b = \frac{qV_l}{qV_l + (1-q)V_b}\alpha_l + \frac{(1-q)c}{qV_l + (1-q)V_b} < \alpha_u \tag{A.2}$$

Proof. See Appendix B ■

A comparison of Propositions 1 and A.2 makes it clear that the types of equilibrium observed in the IPO market do not change if we allow for a positive payoff in the bad state of the economy. What changes is the levels of critical thresholds that determine when the market moves from one equilibrium to the other (i.e., $\underline{q}$, q^*, and $\overline{q}$). In particular, when V_b is positive instead of zero, all thresholds are lower, which makes intuitive sense: The risk of going public early at $t = 0$ is lower when growth opportunities yield a positive payoff rather than nothing if the economy is bad at $t = 1$. Thus, high-growth firms become more willing to take the risk of going public early, hence $\underline{q}^b < \underline{q}$. But, the same is true for low-growth firms, so $q^{*b} < q^*$. Interestingly, $\alpha_u^b < \alpha_u$, which means that high-growth firms need to accept a higher level of underpricing to deter low-growth firms when $V_b > 0$. As a result, the switch back to the pooling equilibrium occurs at a lower q, as $\overline{q}^b < \overline{q}$.

Appendix B. Proofs of Propositions

Proof of Proposition 1. It is intuitive that when q is small, all firms prefer to wait, since their growth opportunities are unlikely to pay off at $t = 1$. If the economy turns out to be good at $t = 1$ (despite the low probability) firms go public. In such a case, investors' breakeven condition at $t = 1$ is: $(1-\alpha_p)(pV_h+(1-p)V_l) = I$. Solving for α_p yields Equation (2). Pooling is an equilibrium if no firm is willing to deviate by going public at $t = 0$. This depends on what investors believe about the type of a firm that follows the out-of-equilibrium strategy. For instance, if they believed that such a firm is a low-growth one, clearly, pooling would always be an equilibrium. However, such a belief is against the Cho-Kreps intuitive criterion (Cho and Kreps, 1987), since low-growth firms would not find it beneficial to follow the out-of-equilibrium strategy. Therefore, consistent with this criterion, we assume that investors believe high-growth firms follow the out-of-equilibrium strategy, since they have a very strong incentive to do so. Then, if an IPO took place at $t = 0$, investors would believe their breakeven condition is: $(1 - \alpha_h)qV_h = I$. Solving for α_h yields Equation (4).[29] Then, high-growth firms can either pool with low-growth ones if the economy is good at $t = 1$ and retain an equity stake of fraction α_p, or they can take the risk of going public at $t = 0$ and retain an equity stake of fraction α_h. They prefer to pool as long as: $\alpha_h qV_h - c \leq q(\alpha_p V_h - c)$. This inequality is satisfied when q is less than or equal to $\underline{q}$. Therefore, the IPO market is in a pooling equilibrium when $q \leq \underline{q}$, and high-growth firms deviate when $q > \underline{q}$.

Next, we investigate a separating equilibrium without underpricing in which high-growth firms go public at $t = 0$, and low-growth ones at $t = 1$ if the economy is good. In equilibrium, investors' beliefs should be consistent with the actions of firms, such that they should value each firm that goes public at $t = 0$ ($t = 1$) as a high-growth (low-growth) firm. Consequently, at $t = 0$, firms can retain fraction α_h of their equity, which is the maximum fraction that satisfies investors' breakeven condition when investors believe they are faced with high-growth firms. Similarly, investors believe they are faced with low-growth firms at $t = 1$. Thus, their breakeven condition at that time is: $(1 - \alpha_l)V_l = I$. Solving for α_l yields Equation (3).[30] Separating without underpricing is an equilibrium if high-growth firms find it optimal to move and low-growth ones find it optimal to wait. Low-growth firms can have an incentive to deviate, since if they moved they would be valued as high-growth firms by

[29] Note that $\alpha_h > \alpha_p$ requires $1 - (I/qV_h) > 1 - (I/\overline{V})$ which simplifies into $q > \overline{V}/V_h$. This inequality always holds when the IPO market is in a separating equilibrium without underpricing, since in such an equilibrium q has to be larger than $\underline{q}$ and because $\underline{q} > \overline{V}/V_h$ it follows that $q > \overline{V}/V_h$.

[30] α_l is smaller than α_p, since $V_l < \overline{V}$.

investors. Therefore, separating equilibrium without underpricing is maintained as long as low-growth firms' optimal action is to wait: $\alpha_h q V_l - c \leq q(\alpha_l V_l - c)$. This inequality is satisfied when q is less than or equal to q^*. Therefore, the IPO market is in a separating equilibrium without underpricing when $\underline{q} < q \leq q^*$, and low-growth firms deviate when $q > q^*$.

When $q > q^*$, high-growth firms can still maintain a separating equilibrium by agreeing to retain an equity stake of α_u that is smaller than α_h, such that low-growth firms are just indifferent between moving and waiting: $\alpha_u q V_l - c = q(\alpha_l V_l - c)$. Solving for α_u yields Equation (5).[31] Separating with underpricing is an equilibrium as long as it is optimal for high-growth firms to underprice their issues. The required level of underpricing is increasing in q (i.e. $\partial\alpha_u/\partial q < 0$). Consequently, when q reaches a threshold, high-growth firms are no longer better off by signaling quality, and when q exceeds that threshold they would rather pool with low-growth firms. In particular, high-growth firms would not deviate from separating equilibrium with underpricing only if: $q(\alpha_p V_h - c) \leq \alpha_u q V_h - c$, which is satisfied when q is less than or equal to $\overline{q}$. Thus, the IPO market is in a separating equilibrium with underpricing when $q^* < q \leq \overline{q}$, and high-growth firms deviate when $q > \overline{q}$.

When $q > \overline{q}$, high-growth firms are better off pooling with low-quality firms at $t = 1$ compared to issuing underpriced shares at $t = 0$, but whether pooling is an equilibrium or not depends on investors' belief about the type of firms that go public at $t = 0$. Clearly, high-growth firms would have an incentive to follow this strategy, if investors believed that an IPO at $t = 0$ is conducted by a high-growth firm. But, under such a belief, given that q is high, low-growth firms would also have an incentive to follow the same strategy to benefit from being valued as high-growth firms. Therefore, we assume that, when $q > \overline{q}$, if investors observe a firm going public at $t = 0$, they believe the firm is a high-growth one with probability p. Consequently, their breakeven condition becomes: $(1-\alpha_{p0})(pqV_h+(1-p)qV_l) = I$. It is easy to show that α_{p0} is always less than or equal to α_p, since $q \leq 1$. Therefore, both types of firms are better off pooling at $t = 1$ rather than at $t = 0$, since the fraction of equity they would retain if they went public at $t = 0$ is smaller, let alone the uncertainty of going public at $t = 0$. As a result, the IPO market is in a pooling equilibrium when $\overline{q} < q \leq 1$, such that all firms wait at $t = 0$ and go public at $t = 1$ if the economy is good. ■

Proof of Proposition A.1. The proof of this proposition proceeds the same way as that of Proposition 1. When q is low, going public at $t = 0$ is too risky, and, thus, all firms wait. At $t = 1$, if the economy turns out to be good, all firms have a project that pays V_l. In this case, investors' breakeven condition is: $(1 - \alpha_l)V_l = I$. Solving for α_l yields

[31] α_u exceeds α_p if $1-(I/V_l)+((1-q)c/qV_l) > 1-(I/\overline{V})$, which is equivalent to $q < c/(p(V_h - V_l)I/\overline{V} + c)$. This inequality always holds when the IPO market is in a separating equilibrium with underpricing, since in such an equilibrium q has to be smaller than $\overline{q}$ and because $\overline{q} < c/(p(V_h - V_l)I/\overline{V} + c)$ it follows that $q < c/(p(V_h - V_l)I/\overline{V} + c)$.

Equation (3). If firms with an early-mover advantage deviate and go public early at $t = 0$, investors' breakeven condition is: $(1 - \alpha_h)qV_h = I$. Solving for α_h yields Equation (4). Firms with an early-mover advantage do not deviate from a pooling equilibrium so long as: $\alpha_h qV_h - c \leq q(\alpha_l V_l - c)$. This inequality is satisfied when $q \leq \underline{q}'$.

When $q > \underline{q}'$, firms with an early-mover advantage have an incentive to go public early at $t = 0$. A separating equilibrium in which firms with an early-mover advantage lead and those with the early-mover advantage follow exist when the latter have no incentive to mimic the former: $\alpha_h qV_l - c \leq q(\alpha_l V_l - c)$. This inequality is satisfied when $q \leq q^{*\prime}$.

When $q > q^{*\prime}$, firms without an early-mover advantage also have an incentive to go public early at $t = 0$, so those with early-mover advantage have to underprice their shares in order to remain as leaders:

$$\alpha_u qV_l - c = q(\alpha_l V_l - c) \tag{B.1}$$

Solving for α_u yields Equation (5). Firms with an early-mover advantage do not deviate from a separating equilibrium with underpricing so long as: $q(\alpha_l V_l - c) \leq \alpha_u qV_h - c$. Substituting Equation B.1 into this inequality yields: $\alpha_u qV_l - c \leq \alpha_u qV_h - c$. This simplifies into $V_l \leq V_h$, which is true by assumption. As a result, firms with an early-mover advantage do not have an incentive to deviate from a separating equilibrium with underpricing, which maintains for $q^{*\prime} < q \leq 1$. ■

Proof of Proposition A.2. If we allow for a positive payoff $0 < V_b < I + c$ in the event of a bad economy, equity stakes at $t = 1$ are unaffected, since it is still optimal to invest if the economy is good and skip the project if the economy is bad. Thus, α_p and α_l (see Equations (2) and (3)) remain the same. However, equity stakes at $t = 0$ change due to the fact that firms that go public and invest at $t = 0$ no longer lose all of their investment if the economy is bad at $t = 1$. When high-growth firms go public at $t = 0$ and low-growth firms wait, investors' breakeven condition is: $(1 - \alpha_h^b)(qV_h + (1 - q)V_b) = I$. Solving for α_h^b yields Equation (A.1). High-growth firms pool with low-growth ones so long as: $\alpha_h^b(qV_h + (1 - q)V_b) - c \leq q(\alpha_p V_h - c)$. Solving for the critical value of q yields $\underline{q}^b$. Low-growth firms prefer to go public at $t = 1$ so long as: $\alpha_h^b(qV_l + (1 - q)V_b) - c \leq q(\alpha_l V_l - c)$. Solving for the critical value of q yields q^{*b}. When $q > q^{*b}$, high-growth firms can maintain the separating equilibrium by accepting a degree of underpricing, such that low-growth firms are just indifferent between moving and waiting: $\alpha_u^b(qV_l + (1-q)V_b) - c = q(\alpha_l V_l - c)$. Solving for α_u^b yields Equation (A.2). This makes sense for high-growth firms so long as they are better off than pooling with low-growth firms at $t = 1$: $q(\alpha_p V_h - c) \leq \alpha_u^b(qV_h + (1-q)V_b) - c$. Solving for the critical value of q yields $\overline{q}^b$. ■

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Table 1: The US IPO market activity

The sample includes 8,160 IPOs that took place in the US between 1975 and 2012. Penny stocks have an offer price less than $5. Financial (Fin'l) firms have an SIC code between 6000 and 6999. Early movers are firms that go public within the first two quarters of a rising IPO cycle, and late movers are those conducting an IPO during the subsequent quarters of the rising IPO cycle. Cold market issuers are those that go public outside rising IPO cycles and the bubble period. The bubble period covers the last quarter of 1999 and the first quarter of 2000. First-day return is the percentage change between the offer price and the first trading day closing price. Mean and median first-day returns are reported for the full sample and for the subsamples that exclude either penny stocks or financial firms.

	Number of IPOs			First-day return (%)					
				All		ex. Penny		ex. Fin'l	
	All	Penny	Fin'l	mean	median	mean	median	mean	median
Panel A: Breakdown by year									
1975	11	0	0	0.80	0.00	0.80	0.00	0.80	0.00
1976	27	1	0	3.35	0.45	2.76	0.22	3.35	0.45
1977	16	3	2	10.86	5.00	5.71	1.67	10.51	2.71
1978	24	5	1	17.53	10.07	14.82	6.06	17.68	6.06
1979	43	6	1	12.63	10.42	11.33	6.82	12.95	10.42
1980	97	26	3	33.65	12.50	17.49	10.00	34.63	13.23
1981	259	65	7	12.83	4.17	7.27	1.91	12.79	4.17
1982	82	8	1	11.68	4.92	12.15	4.92	11.83	5.21
1983	491	42	29	14.06	4.69	11.44	4.00	13.82	4.69
1984	201	32	7	6.33	1.56	4.43	1.25	6.41	1.56
1985	215	30	15	10.46	3.95	7.23	3.13	10.58	4.07
1986	423	31	55	8.86	2.50	7.28	2.13	9.20	2.74
1987	319	40	22	9.90	2.38	6.42	1.79	10.31	2.50
1988	123	19	4	9.35	2.68	5.53	2.24	8.93	2.68
1989	120	9	5	10.13	4.75	8.58	4.31	10.34	5.36
1990	120	13	5	11.78	6.33	10.91	5.17	11.84	6.25
1991	291	16	23	12.42	7.76	11.86	7.50	12.86	8.17
1992	411	17	38	10.61	4.17	9.86	4.17	10.82	4.17
1993	518	14	40	12.80	6.62	12.64	6.49	13.18	6.55
1994	410	16	19	9.36	4.17	9.42	4.17	9.56	4.17
1995	477	14	34	21.68	13.33	21.55	13.24	21.88	13.89
1996	697	16	41	17.02	10.16	16.87	10.00	17.33	10.00
1997	485	10	32	14.07	9.26	13.76	9.38	14.03	8.33
1998	285	4	20	22.00	9.38	22.11	9.38	22.88	9.38
1999	470	1	24	71.30	37.50	71.46	37.50	73.92	42.71
2000	375	0	3	57.14	28.57	57.14	28.57	57.30	28.61
2001	74	0	7	14.61	10.22	14.61	10.22	14.92	10.00
2002	65	0	9	9.03	8.33	9.03	8.33	9.44	8.45
2003	63	1	13	11.76	8.68	11.95	9.23	12.18	9.23
2004	169	0	22	12.37	6.97	12.37	6.97	12.45	6.97
2005	155	0	17	10.71	6.00	10.71	6.00	10.00	5.88
2006	156	1	20	12.18	7.06	12.15	6.38	11.23	6.11
2007	153	3	13	14.31	6.82	13.95	6.71	14.72	6.84
2008	21	2	0	19.09	-0.53	7.76	-1.25	19.09	-0.53
2009	43	2	1	10.66	6.58	9.83	5.71	10.79	6.67
2010	98	5	11	8.51	2.00	9.01	2.78	7.93	1.70
2011	80	1	2	13.63	6.20	13.81	6.25	13.98	6.36
2012	93	2	5	17.23	10.90	17.50	11.11	17.65	11.01
All	8,160	455	551	18.77	6.98	18.11	6.58	19.30	7.03
Panel B: Breakdown by timing									
Early movers	1,618	68	121	22.82	10.00	22.25	9.51	23.13	10.00
Late movers	3,108	219	227	12.51	5.00	10.93	4.30	12.79	5.00
Cold	3,168	168	195	16.32	6.82	15.93	6.58	16.74	6.78
Bubble	266	0	8	96.64	63.92	96.64	63.92	99.31	65.82
All	8,160	455	551	18.77	6.98	18.11	6.58	19.30	7.03

Table 2: The distribution of first-day returns

The sample includes 8,160 IPOs that took place in the US between 1975 and 2012. Early movers are firms that go public within the first two quarters of a rising IPO cycle, and late movers are those conducting an IPO during the subsequent quarters of the rising IPO cycle. Cold market issuers are those that go public outside rising IPO cycles and the bubble period. The bubble period covers the last quarter of 1999 and the first quarter of 2000. First-day return is the percentage change between the offer price and the first trading day closing price. In panel A, the sample is split on the basis of Carter and Manaster (1990) underwriter reputation rankings, which are based on a 9-point scale. In panel B, industry betas are estimated over a 10-year period using 49 Fama-French industry portfolios. In panel C, age is the difference between the IPO year and the foundation year. In panel D, downward (upward) revision means that the offer price is set below (above) the initial file price range. In panel E, share overhang is the ratio of retained shares to the public float. In panel F, pre-IPO market return is calculated as the market's return over the 15 trading days before the IPO. The value-weighted index of NYSE/AMEX/NASDAQ stocks is used.

	mean	p25	median	p75	count
Panel A: Underwriter reputation ranking					
Less than 8					
Early movers in hot markets	19.39	1.67	10.00	30.00	615
Late movers in hot markets	14.04	0.40	5.45	18.18	1,398
Cold market issuers	12.61	0.63	5.56	17.19	1,191
Bubble period issuers	59.37	2.78	38.44	79.69	50
All	15.22	0.76	6.25	20.00	3,254
8 or higher					
Early movers in hot markets	25.22	0.90	10.16	28.64	954
Late movers in hot markets	11.33	0.00	4.55	17.24	1,586
Cold market issuers	18.54	0.42	7.71	22.22	1,882
Bubble period issuers	106.05	23.61	69.82	159.56	214
All	21.49	0.06	7.50	23.68	4,636
Panel B: Industry beta					
Less than or equal to 1					
Early movers in hot markets	16.93	0.42	7.14	22.19	406
Late movers in hot markets	11.45	0.00	4.00	15.00	875
Cold market issuers	13.08	0.00	5.11	17.50	873
Bubble period issuers	70.89	6.25	50.00	87.50	75
All	15.09	0.00	5.21	18.75	2,229
Greater than 1					
Early movers in hot markets	24.78	1.60	11.05	31.25	1,211
Late movers in hot markets	12.95	0.00	5.31	18.75	2,224
Cold market issuers	17.52	0.69	7.35	21.43	2,288
Bubble period issuers	106.75	22.92	70.83	174.69	191
All	20.17	0.66	7.69	23.68	5,914

Table 2 - cont'd.

	mean	p25	median	p75	count
			Panel C: The winner's curse		
Less than 4 years old					
Early movers in hot markets	34.80	1.56	15.63	44.27	413
Late movers in hot markets	15.59	0.74	6.25	20.00	709
Cold market issuers	19.83	0.78	7.14	21.88	648
Bubble period issuers	98.58	10.42	62.50	150.39	89
All	25.31	1.00	8.75	27.08	1,859
4 to 16 years old					
Early movers in hot markets	21.58	1.79	11.11	29.17	839
Late movers in hot markets	12.58	0.00	5.62	19.27	1,612
Cold market issuers	17.44	0.76	7.95	22.73	1,625
Bubble period issuers	103.54	23.26	72.14	147.74	148
All	19.42	0.57	8.00	25.00	4,224
More than 16 years old					
Early movers in hot markets	10.08	0.00	4.59	15.34	350
Late movers in hot markets	7.67	0.00	2.86	11.96	733
Cold market issuers	10.40	0.00	4.76	14.97	840
Bubble period issuers	57.88	9.38	39.38	73.75	28
All	10.00	0.00	4.05	13.97	1,951
			Panel D: Partial adjustment phenomenon		
Downward revision					
Early movers in hot markets	4.28	0.00	0.71	4.76	308
Late movers in hot markets	2.74	0.00	0.61	4.08	784
Cold market issuers	4.81	0.00	1.14	6.25	831
Bubble period issuers	3.34	0.00	0.35	6.25	17
All	3.88	0.00	0.83	5.00	1,940
Within file range					
Early movers in hot markets	15.75	1.20	8.33	21.88	810
Late movers in hot markets	11.71	0.27	6.05	17.31	1,486
Cold market issuers	13.18	0.78	7.34	18.75	1,514
Bubble period issuers	29.81	0.00	12.50	50.00	87
All	13.52	0.76	7.14	19.17	3,897
Upward revision					
Early movers in hot markets	51.04	14.75	31.37	57.61	412
Late movers in hot markets	28.72	10.71	22.19	40.00	405
Cold market issuers	42.41	13.64	25.57	50.96	601
Bubble period issuers	144.15	64.85	116.54	190.89	156
All	51.23	13.89	28.75	58.75	1,574

Table 2 - cont'd.

	mean	p25	median	p75	count
			Panel E: Insiders' wealth losses		
Low overhang (<1.6)					
Early movers in hot markets	13.18	0.00	6.25	19.64	380
Late movers in hot markets	12.21	0.00	4.17	15.48	800
Cold market issuers	10.01	0.00	4.25	15.85	738
Bubble period issuers	49.45	10.94	45.59	84.69	24
All	12.02	0.00	4.94	16.67	1,942
Medium overhang					
Early movers in hot markets	17.60	1.04	10.00	27.21	877
Late movers in hot markets	11.72	0.00	5.00	17.31	1,663
Cold market issuers	14.76	0.83	6.90	19.82	1,667
Bubble period issuers	59.09	3.13	47.81	88.33	105
All	15.24	0.45	6.75	20.83	4,312
High overhang (>3.75)					
Early movers in hot markets	45.13	3.45	21.02	55.15	359
Late movers in hot markets	14.90	0.00	5.58	20.00	638
Cold market issuers	26.07	0.85	10.00	29.58	755
Bubble period issuers	133.69	36.25	99.31	192.86	137
All	33.72	1.04	11.20	35.53	1,889
			Panel F: Investor sentiment		
Pre-IPO market return <0%					
Early movers in hot markets	23.39	0.00	7.81	27.27	449
Late movers in hot markets	10.68	0.00	3.57	13.89	1,265
Cold market issuers	15.20	0.00	4.94	19.06	1,144
Bubble period issuers	97.90	22.46	71.16	162.43	68
All	16.43	0.00	4.94	18.75	2,926
Between 0% and 2%					
Early movers in hot markets	17.74	1.04	8.14	25.00	553
Late movers in hot markets	11.86	0.00	4.88	18.75	797
Cold market issuers	14.38	0.35	6.25	17.98	840
Bubble period issuers	98.13	13.13	57.29	139.86	92
All	17.69	0.37	6.53	21.43	2,282
Pre-IPO market return >2%					
Early movers in hot markets	26.95	2.88	13.48	33.82	616
Late movers in hot markets	15.22	0.50	7.00	20.83	1,046
Cold market issuers	18.77	1.25	9.01	23.23	1,184
Bubble period issuers	94.53	17.71	62.63	141.67	106
All	21.94	1.25	9.62	25.63	2,952

Table 3: Do early movers underprice more than other IPO firms?

Output of OLS regression models is reported. The sample includes 8,160 IPOs that took place in the US between 1975 and 2012. The dependent variable is R, which is the percentage change between the offer price and the first trading day closing price. E is equal to one if the IPO took place within the first two quarters of a rising IPO cycle and to zero otherwise. *Age* is the difference between the IPO year and the foundation year. $Tech$ is a dummy variable equal to one when the issuer is a technology firm. $Market$ is the percentage return on the value-weighted index of NYSE/AMEX/NASDAQ stocks over the 15 trading days before the IPO. *Bubble* is a dummy variable equal to one if the IPO took place between the last quarter of 1999 and the first quarter of 2000. *Overhang* is the ratio of retained shares to the public float. *Revision* is the percentage change between the offer price and the midpoint of the initial file price range. β_{ind} is the industry beta estimated over the past 10 years. VC, *Penny*, *Spinoff*, *RLBO*, and *Financial* are dummy variables and are equal to one if the firm is backed by venture capital, the offer price is less than $5, the issue is a partial spinoff, the issue is a reverse LBO, and the issuer is a financial firm respectively. Model (8) ((9)) is based on IPOs underwritten by low-prestige (high-prestige) banks that have a Carter and Manaster (1990) ranking of less than (greater than or equal to) 8. Robust standard errors are reported in parentheses. ***, **, and * stand for significance at 1, 5, and 10% levels respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
E	5.32***	4.59***	7.75***	8.11***	3.06***	2.94***	2.91***	4.04***	2.63**
	(1.13)	(1.09)	(1.04)	(1.01)	(0.92)	(0.91)	(0.92)	(1.11)	(1.29)
$\ln(1 + Age)$		−3.89***	−3.14***	−3.06***	−2.47***	−2.29***	−2.31***	−1.61***	−2.51***
		(0.35)	(0.33)	(0.32)	(0.30)	(0.30)	(0.30)	(0.39)	(0.46)
$Tech$		15.07***	12.27***	10.35***	5.94***	5.10***	4.34***	3.62***	3.62***
		(1.08)	(0.96)	(0.94)	(0.91)	(0.96)	(0.93)	(0.98)	(1.38)
$Market$			0.53***	0.62***	0.35**	0.36***	0.37***	0.45***	0.32
			(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.16)	(0.20)
Bubble			77.71***	73.66***	49.48***	48.96***	48.98***	39.30***	48.72***
			(6.88)	(6.71)	(5.29)	(5.27)	(5.27)	(10.54)	(5.89)
Overhang				2.78***	2.24***	2.20***	2.21***	0.84***	2.90***
				(0.41)	(0.34)	(0.33)	(0.33)	(0.26)	(0.45)
Revision					0.81***	0.81***	0.81***	0.43***	0.92***
					(0.05)	(0.05)	(0.05)	(0.07)	(0.05)
VC						3.42***	3.47***	−0.67	3.76***
						(0.78)	(0.78)	(0.99)	(1.15)
β_{ind}							3.08**	0.60	3.31**
							(1.28)	(1.97)	(1.67)
Penny	11.07***	4.06**	7.33***	8.00***	5.56***	6.42***	6.00***	7.26***	28.82*
	(2.12)	(1.99)	(1.95)	(2.06)	(1.79)	(1.79)	(1.79)	(1.62)	(16.27)
Spinoff	−6.26***	−3.65***	−3.49***	−4.71***	−4.14***	−3.41***	−3.44***	−4.31***	−3.70***
	(1.17)	(1.14)	(1.06)	(1.08)	(1.02)	(1.01)	(1.01)	(1.12)	(1.40)
RLBO	−10.10***	−3.88***	−2.15**	−1.99**	−1.69**	−1.36*	−1.42*	−1.60	−1.38
	(0.88)	(0.87)	(0.85)	(0.88)	(0.80)	(0.80)	(0.81)	(1.50)	(1.04)
Financial	−6.96***	−1.75**	−1.51	−1.44	−1.75*	−1.19	−1.11	−1.08	−1.62
	(0.96)	(0.85)	(0.92)	(0.89)	(0.90)	(0.90)	(0.90)	(1.43)	(1.19)
Constant	18.44***	21.37***	16.80***	9.09***	13.64***	12.20***	8.97***	12.89***	7.35***
	(0.56)	(1.09)	(0.93)	(1.38)	(1.24)	(1.25)	(1.85)	(2.67)	(2.49)
Observations	8,057	7,937	7,937	7,926	7,246	7,246	7,233	2,717	4,431
R-squared	0.02	0.06	0.18	0.21	0.40	0.40	0.40	0.20	0.45

Table 4: Distributions of price-to-value ratios

In panels A and B, the sample is based on 3,500 nonfinancial IPOs with an offer price of at least $5, that have positive sales and EBITDA in the fiscal year prior to the IPO, that took place in the US between 1975 and 2012, and that match with at least one public firm on the basis of industry, size, and profitability. In panel C, the sample is further restricted to IPOs with positive earnings. In panel D, the sample is enlarged to include IPOs with negative EBITDA. Early movers are firms that go public within the first two quarters of a rising IPO cycle, and late movers are those conducting an IPO during the subsequent quarters of the rising IPO cycle. Cold market issuers are those that go public outside rising IPO cycles and the bubble period. The bubble period covers the last quarter of 1999 and the first quarter of 2000. $UP = 3$ indicates the top tercile and $UP < 3$ indicates the bottom and middle terciles of the underpricing distribution. Leaders are early movers with $UP = 3$. $P/Sales$, $P/EBITDA$, and $P/Earnings$ are calculated as the ratio of the IPO firm's price-to-sales, price-to-EBITDA, and price-to-earnings multiplier to the corresponding multiplier of the matching firm respectively. For the IPO firm, either the offer price or the first-day closing price is used. For the matching firm, the closing market price on the IPO firm's listing date is used. The number of shares outstanding is obtained from CRSP, except when the IPO firm has a dual-class share structure, in which case the figure is obtained from the SDC. $Sales$, $EBITDA$, and $Earnings$ figures come from the fiscal year prior to the IPO for both the IPO firm and the matching firm. p-Values for Wilcoxon rank sum tests are reported to compare the distributions of price-to-value ratios between leaders and other groups of IPOs.

	Offer price				First-day closing price				
	p25	median	p75	p-value	p25	median	p75	p-value	count
Panel A: P/Sales									
Size									
Early movers: (i) $UP = 3$	1.12	2.64	5.19	-	1.41	3.40	7.50	-	242
(ii) $UP < 3$	0.70	1.51	3.06	<0.01	0.72	1.54	3.14	<0.01	439
Late movers in hot markets	0.74	1.55	3.34	<0.01	0.79	1.71	3.66	<0.01	1,314
Cold market issuers	0.76	1.58	3.47	<0.01	0.85	1.78	3.95	<0.01	1,452
Bubble period issuers	2.26	4.77	7.79	<0.01	2.90	7.13	13.30	<0.01	53
All	0.76	1.62	3.52	-	0.83	1.81	4.04	-	3,500
Size & Profitability									
Early movers: (i) $UP = 3$	1.29	2.40	4.69	-	1.68	3.09	6.31	-	242
(ii) $UP < 3$	0.69	1.49	2.77	<0.01	0.71	1.55	2.92	<0.01	439
Late movers in hot markets	0.82	1.49	3.12	<0.01	0.84	1.63	3.45	<0.01	1,314
Cold market issuers	0.76	1.63	3.27	<0.01	0.84	1.83	3.81	<0.01	1,452
Bubble period issuers	1.54	3.77	8.58	0.03	2.75	6.34	17.22	<0.01	53
All	0.79	1.61	3.28	-	0.85	1.79	3.77	-	3,500
Panel B: P/EBITDA									
Size									
Early movers: (i) $UP = 3$	1.12	2.36	4.59	-	1.49	3.14	6.57	-	242
(ii) $UP < 3$	0.73	1.46	2.91	<0.01	0.76	1.54	3.04	<0.01	439
Late movers in hot markets	0.67	1.38	2.86	<0.01	0.68	1.47	3.31	<0.01	1,314
Cold market issuers	0.73	1.43	2.91	<0.01	0.81	1.60	3.41	<0.01	1,452
Bubble period issuers	1.96	3.87	11.40	<0.01	2.49	7.82	19.13	<0.01	53
All	0.72	1.48	3.09	-	0.78	1.61	3.57	-	3,500
Size & Profitability									
Early movers: (i) $UP = 3$	1.24	2.43	4.80	-	1.61	3.18	6.72	-	242
(ii) $UP < 3$	0.72	1.36	2.66	<0.01	0.76	1.45	2.81	<0.01	439
Late movers in hot markets	0.77	1.46	2.84	<0.01	0.81	1.58	3.24	<0.01	1,314
Cold market issuers	0.78	1.50	3.09	<0.01	0.83	1.65	3.49	<0.01	1,452
Bubble period issuers	1.26	3.26	8.89	0.12	1.58	5.56	19.10	0.02	53
All	0.78	1.53	3.13	-	0.84	1.68	3.54	-	3,500

Table 4 - cont'd.

	Offer price				First-day closing price				
	p25	median	p75	p-value	p25	median	p75	p-value	count
Panel C: P/Earnings									
Size									
Early movers: (i) $UP = 3$	1.09	2.48	4.72	-	1.40	3.19	6.62	-	211
(ii) $UP < 3$	0.67	1.45	3.02	<0.01	0.68	1.49	3.24	<0.01	365
Late movers in hot markets	0.70	1.54	3.45	<0.01	0.73	1.66	3.76	<0.01	1,096
Cold market issuers	0.77	1.55	3.33	<0.01	0.83	1.75	3.70	<0.01	1,191
Bubble period issuers	1.13	4.04	7.53	0.05	1.57	5.97	13.71	0.01	34
All	0.74	1.60	3.48	-	0.80	1.76	3.93	-	2,897
Size & Profitability									
Early movers: (i) $UP = 3$	1.01	2.26	3.80	-	1.39	2.89	5.18	-	211
(ii) $UP < 3$	0.67	1.32	2.40	<0.01	0.68	1.35	2.52	<0.01	365
Late movers in hot markets	0.68	1.36	2.75	<0.01	0.74	1.46	3.15	<0.01	1,096
Cold market issuers	0.71	1.44	2.98	<0.01	0.77	1.66	3.36	<0.01	1,191
Bubble period issuers	0.98	3.40	8.22	0.10	2.14	4.35	12.87	0.02	34
All	0.72	1.45	2.93	-	0.77	1.62	3.34	-	2,897
Panel D: P/Sales (negative EBITDA issuers included)									
Size									
Early movers: (i) $UP = 3$	1.00	2.48	5.54	-	1.33	3.46	8.78	-	393
(ii) $UP < 3$	0.63	1.34	3.10	<0.01	0.65	1.42	3.20	<0.01	556
Late movers in hot markets	0.69	1.48	3.54	<0.01	0.72	1.62	3.93	<0.01	1,654
Cold market issuers	0.74	1.61	3.90	<0.01	0.81	1.84	4.53	<0.01	1,914
Bubble period issuers	1.44	3.46	7.40	<0.01	2.57	6.75	16.87	<0.01	172
All	0.72	1.62	3.91	-	0.79	1.87	4.59	-	4,689
Size & Profitability									
Early movers: (i) $UP = 3$	1.39	2.60	5.01	-	1.82	3.61	8.21	-	393
(ii) $UP < 3$	0.69	1.48	2.91	<0.01	0.71	1.51	2.98	<0.01	556
Late movers in hot markets	0.79	1.52	3.23	<0.01	0.84	1.66	3.59	<0.01	1,654
Cold market issuers	0.77	1.73	3.66	<0.01	0.85	1.92	4.31	<0.01	1,914
Bubble period issuers	1.49	3.60	7.95	0.01	2.76	7.07	18.07	<0.01	172
All	0.81	1.69	3.63	-	0.88	1.91	4.39	-	4,689

Table 5: Do investors value leaders more highly?

Output of OLS regression models is reported. In the first two models, the sample is based on 3,500 nonfinancial IPOs with an offer price of at least $5, that have positive sales and EBITDA in the fiscal year prior to the IPO, that took place in the US between 1975 and 2012, and that match with at least one public firm on the basis of industry, size, and profitability. In the third model, the sample is further restricted to IPOs with positive earnings. In the final three models, the sample is enlarged to include IPOs with negative EBITDA. In all models, the dependent variable is a price-to-value ratio and is winsorized at the top and bottom 5%. $P/Sales$, $P/EBITDA$, and $P/Earnings$ are calculated as the ratio of the IPO firm's price-to-sales, price-to-EBITDA, and price-to-earnings multiplier to the corresponding multiplier of the matching firm respectively. For the IPO firm, either the offer price (panel A) or the first-day closing price (panel B) is used. For the matching firm, the closing market price on the IPO firm's listing date is used. The number of shares outstanding is obtained from CRSP, except when the IPO firm has a dual-class share structure, in which case the figure is obtained from the SDC. $Sales$, $EBITDA$, and $Earnings$ figures come from the fiscal year prior to the IPO (year -1) for both the IPO firm and the matching firm. L is equal to one when the firm is a leader (early mover with high underpricing) in a hot market and zero otherwise. $Sales_{-1}$ is net sales (adjusted for inflation) in year -1. $Debt_{-1}$ and $CapX_{-1}$ are long-term debt and capital expenditures as a percentage of total assets in year -1 respectively. Age is the difference between the IPO year and the foundation year. VC is equal to one if the IPO firm is venture capital backed and zero otherwise. $Tech$ is a dummy variable equal to one when the issuer is a technology firm. $\%Sec$ is the number of secondary shares sold as a percentage of the total number of shares sold. $Bubble$ is a dummy variable equal to one if the IPO took place between the last quarter of 1999 and the first quarter of 2000. UW is a dummy variable equal to one if the IPO is underwritten by a high-prestige bank with a Carter and Manaster (1990) ranking of 8 or higher. In panel B, same covariates are used but only the coefficient of L is reported to save space. Robust standard errors are reported in parentheses. ***, **, and * stand for significance at 1, 5, and 10% levels respectively.

				$P/Sales$		
	$P/Sales$	$P/EBITDA$	$P/Earnings$	All	$UW=0$	$UW=1$
Panel A: Price-to-value ratios calculated at the offer price						
L	0.677***	0.814***	0.597***	0.850***	0.602**	0.862***
	(0.196)	(0.215)	(0.187)	(0.196)	(0.300)	(0.240)
$ln(Sales_{-1})$	−0.161***	−0.176***	−0.050	−0.033	0.097*	−0.220***
	(0.035)	(0.038)	(0.036)	(0.030)	(0.057)	(0.041)
$Debt_{-1}$	−0.004**	−0.010***	−0.005***	−0.003**	0.002	−0.004***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.003)	(0.001)
$CapX_{-1}$	0.017***	0.009*	0.011***	0.028***	0.019***	0.033***
	(0.005)	(0.005)	(0.004)	(0.005)	(0.006)	(0.007)
$ln(1+Age)$	−0.204***	−0.239***	−0.129***	−0.353***	−0.251***	−0.347***
	(0.047)	(0.050)	(0.047)	(0.052)	(0.074)	(0.067)
VC	0.425***	0.621***	0.465***	0.415***	0.582***	−0.157
	(0.097)	(0.106)	(0.096)	(0.101)	(0.154)	(0.139)
$Tech$	0.344***	0.274**	0.284***	0.811***	0.422***	0.947***
	(0.102)	(0.112)	(0.099)	(0.103)	(0.138)	(0.136)
$\%Sec$	−0.002	−0.009***	−0.001	−0.001	0.002	−0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
$Bubble$	2.230***	2.057***	1.911***	1.810***	0.684	1.698***
	(0.557)	(0.576)	(0.593)	(0.348)	(0.523)	(0.396)
Constant	3.485***	3.988***	2.569***	3.098***	1.824***	4.465***
	(0.199)	(0.227)	(0.200)	(0.181)	(0.254)	(0.269)
Observations	3,417	3,417	2,834	4,575	1,421	3,103
R-squared	0.079	0.101	0.054	0.087	0.046	0.113
Panel B: Price-to-value ratios calculated at the first-day closing price						
L	1.452***	1.548***	1.198***	2.101***	1.410***	2.249***
	(0.266)	(0.283)	(0.240)	(0.287)	(0.427)	(0.352)
Observations	3,417	3,417	2,834	4,575	1,421	3,103
R-squared	0.101	0.120	0.075	0.138	0.070	0.170

Table 6: Distributions of post-IPO operating performance variables

The sample is based on 4,689 nonfinancial IPOs with an offer price of at least $5, that have positive sales in the fiscal year prior to the IPO, that took place in the US between 1975 and 2012, and that match with at least one public firm on the basis of industry, size, and profitability. A matching firm is eliminated if its operating performance is missing (for example due to delisting) in a particular fiscal year, while the IPO firm's operating performance is available during the same fiscal year. In such cases the next available matching firm is used. Early movers are firms that go public within the first two quarters of a rising IPO cycle, and late movers are those conducting an IPO during the subsequent quarters of the rising IPO cycle. Cold market issuers are those that go public outside rising IPO cycles and the bubble period. The bubble period covers the last quarter of 1999 and the first quarter of 2000. $UP = 3$ indicates the top tercile and $UP < 3$ indicates the bottom and middle terciles of the underpricing distribution. Leaders are early movers with $UP = 3$. $\Delta Sales_y$ ($\Delta CapX_y$) is the percentage growth in net sales (capital expenditures) between years -1 and y for the IPO firm minus the corresponding growth rate for the matching firm. $\Delta Prof_y$ is the change in the level of EBITDA as a percentage of total assets between years -1 and y for the IPO firm minus the corresponding change for the matching firm. In panel B, for firms that delist within three years after going public, the rates for the last fiscal year before delisting are rolled over to subsequent years. Median values are reported and number of observations are indicated underneath. p-Values for Wilcoxon rank sum tests are reported to compare the distributions of price-to-value ratios between leaders and other groups of IPOs.

	$\Delta Sales_y$				$\Delta CapX_y$				$\Delta Prof_y$			
	-1 to 0	-1 to 1	-1 to 2	-1 to 3	-1 to 0	-1 to 1	-1 to 2	-1 to 3	-1 to 0	-1 to 1	-1 to 2	-1 to 3
Panel A												
(a) Early movers: (i) $UP = 3$	47.54	97.20	103.06	129.22	75.81	180.81	134.82	105.71	1.34	0.76	-0.39	-0.16
	367	341	310	283	360	329	300	272	366	336	305	279
(b) (ii) $UP < 3$	11.31	24.94	40.99	51.41	30.72	80.38	69.66	64.46	0.07	-2.00	-2.55	-3.69
	514	487	448	407	500	471	433	390	510	483	444	403
(c) Late movers in hot markets	16.78	31.51	52.46	78.47	40.67	77.09	74.95	97.92	-0.54	-2.27	-2.78	-3.44
	1,495	1,421	1,284	1,141	1,472	1,388	1,242	1,095	1,497	1,419	1,275	1,130
(d) Cold market issuers	21.84	38.07	60.05	76.22	47.32	94.03	79.60	61.97	0.21	-1.52	-3.11	-3.51
	1,750	1,610	1,455	1,331	1,711	1,562	1,407	1,281	1,746	1,601	1,447	1,318
(e) Bubble period issuers	74.33	114.36	87.20	91.58	94.56	158.65	35.49	0.31	4.17	1.29	-2.79	1.45
	162	147	129	110	156	141	122	105	159	145	127	109
All	20.99	37.49	56.78	75.02	46.50	92.27	79.32	73.71	0.06	-1.71	-2.79	-3.14
	4,288	4,006	3,626	3,272	4,199	3,891	3,504	3,143	4,278	3,984	3,598	3,239
p-value												
(a) vs (b)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.083	0.100	0.013	0.422	0.041
(a) vs (c)	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	0.600	0.011	0.001	0.180	0.007
(a) vs (d)	<0.001	<0.001	<0.001	0.001	0.018	<0.001	0.003	0.127	0.052	0.002	0.087	0.007
(a) vs (e)	0.038	0.419	0.354	0.172	0.848	0.266	0.014	0.001	0.148	0.851	0.470	0.714

Table 6 - cont'd.

	$\Delta Sales_y$				$\Delta CapX_y$				$\Delta Prof_y$			
	-1 to 0	-1 to 1	-1 to 2	-1 to 3	-1 to 0	-1 to 1	-1 to 2	-1 to 3	-1 to 0	-1 to 1	-1 to 2	-1 to 3
Panel B												
(a) Early movers: (i) $UP = 3$	47.54	96.63	102.84	122.71	75.81	174.60	132.79	102.37	1.34	0.76	-0.33	0.02
	367	367	367	367	360	360	360	360	366	366	366	366
(b) (ii) $UP < 3$	11.31	25.14	38.67	43.22	30.72	74.92	71.30	65.53	0.07	-1.64	-2.35	-2.74
	514	514	514	514	500	500	500	500	510	510	510	510
(c) Late movers in hot markets	16.78	31.04	48.06	58.32	40.67	75.71	71.71	79.60	-0.54	-2.15	-2.69	-3.14
	1,495	1,495	1,495	1,495	1,472	1,472	1,472	1,472	1,497	1,497	1,497	1,497
(d) Cold market issuers	21.84	36.43	51.90	57.46	47.32	89.42	77.59	66.22	0.21	-1.48	-2.79	-3.04
	1,750	1,750	1,750	1,750	1,711	1,711	1,711	1,711	1,746	1,746	1,746	1,746
(e) Bubble period issuers	74.33	108.76	102.56	108.21	94.56	153.71	45.58	26.18	4.17	1.32	-1.36	2.42
	162	162	162	162	156	156	156	156	159	159	159	159
All	20.99	36.68	52.36	59.92	46.50	88.94	78.37	71.34	0.06	-1.55	-2.51	-2.79
	4,288	4,288	4,288	4,288	4,199	4,199	4,199	4,199	4,278	4,278	4,278	4,278
p-value												
(a) vs (b)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.078	0.100	0.011	0.305	0.065
(a) vs (c)	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.118	0.011	<0.001	0.058	0.003
(a) vs (d)	<0.001	<0.001	<0.001	<0.001	0.018	<0.001	0.001	0.119	0.052	0.001	0.037	0.005
(a) vs (e)	0.038	0.513	0.739	0.499	0.848	0.180	0.015	0.004	0.148	0.910	0.914	0.446

Table 7: Do leaders grow faster than other IPO firms ex post?

Output of OLS regression models is reported. The sample is based on 4,689 nonfinancial IPOs with an offer price of at least $5, that have positive sales in the fiscal year prior to the IPO, that took place in the US between 1975 and 2012, and that match with at least one public firm on the basis of industry, size, and profitability. A matching firm is eliminated if its operating performance is missing (for example due to delisting) in a particular fiscal year, while the IPO firm's operating performance is available during the same fiscal year. In such cases the next available matching firm is used. The dependent variable is a post-IPO operating performance measure and is winsorized at the top and bottom 5%. $\Delta Sales_y$ ($\Delta CapX_y$) is the percentage growth in net sales (capital expenditures) between years -1 and y for the IPO firm minus the corresponding growth rate for the matching firm. $\Delta Prof_y$ is the change in the level of EBITDA as a percentage of total assets between years -1 and y for the IPO firm minus the corresponding change for the matching firm. L is equal to one when the firm is a leader (early mover with high underpricing) in a hot market and zero otherwise. $Sales_{-1}$ is net sales (adjusted for inflation) in year -1. $Debt_{-1}$ and $CapX_{-1}$ are long-term debt and capital expenditures as a percentage of total assets in year -1 respectively. Age is the difference between the IPO year and the foundation year. VC is equal to one if the IPO firm is venture capital backed and zero otherwise. $Tech$ is a dummy variable equal to one when the issuer is a technology firm. $\%Sec$ is the number of secondary shares sold as a percentage of the total number of shares sold. $Bubble$ is a dummy variable equal to one if the IPO took place between the last quarter of 1999 and the first quarter of 2000. In panel B, for firms that delist within three years after going public, the rates for the last fiscal year before delisting are rolled over to subsequent years. Moreover, same covariates are used but only the coefficient of L is reported to save space. Robust standard errors are reported in parentheses. ***, **, and * stand for significance at 1, 5, and 10% levels respectively.

	$\Delta Sales_y$				$\Delta CapX_y$				$\Delta Prof_y$			
	-1 to 0	-1 to 1	-1 to 2	-1 to 3	-1 to 0	-1 to 1	-1 to 2	-1 to 3	-1 to 0	-1 to 1	-1 to 2	-1 to 3
					Panel A							
L	26.23***	70.98***	74.48***	78.20***	41.51***	179.68***	130.41***	30.49	3.94***	5.92***	2.39	5.36***
	(5.07)	(12.62)	(18.39)	(25.78)	(14.75)	(31.61)	(40.93)	(42.72)	(1.30)	(1.49)	(1.68)	(1.87)
$ln(Sales_{-1})$	−8.41***	−18.84***	−25.63***	−36.92***	−20.18***	−46.30***	−30.11***	−22.59**	−1.96***	−0.36	−0.23	−0.73**
	(1.06)	(2.48)	(3.77)	(5.37)	(3.06)	(5.97)	(8.11)	(9.01)	(0.25)	(0.28)	(0.33)	(0.36)
$Debt_{-1}$	−0.07	−0.15	−0.16	0.21	0.20	0.01	−0.24	−0.07	0.05***	0.05***	0.07***	0.06***
	(0.04)	(0.09)	(0.16)	(0.21)	(0.13)	(0.20)	(0.31)	(0.42)	(0.01)	(0.01)	(0.01)	(0.01)
$CapX_{-1}$	0.23*	0.81**	1.17**	1.04*	−4.64***	−9.66***	−12.04***	−13.50***	−0.06**	−0.06	0.01	0.01
	(0.14)	(0.32)	(0.46)	(0.62)	(0.42)	(0.86)	(1.20)	(1.38)	(0.03)	(0.03)	(0.04)	(0.05)
$ln(1 + Age)$	−10.37***	−23.21***	−37.22***	−51.52***	−24.28***	−60.86***	−87.31***	−94.56***	0.31	0.51	−0.01	0.34
	(1.44)	(3.30)	(4.91)	(7.01)	(4.45)	(8.98)	(12.17)	(14.52)	(0.32)	(0.39)	(0.45)	(0.49)
VC	6.07**	6.97	21.81**	52.39***	−41.77***	−78.28***	−54.47**	4.18	6.17***	6.97***	7.25***	7.66***
	(2.70)	(6.22)	(9.54)	(13.75)	(8.48)	(17.50)	(23.68)	(27.20)	(0.68)	(0.80)	(0.94)	(1.05)
$Tech$	9.48***	16.81**	17.52*	6.80	−4.95	−23.72	−21.74	−33.36	−0.84	−2.20***	−2.07**	−2.72**
	(2.92)	(6.66)	(10.22)	(14.50)	(8.71)	(17.36)	(23.79)	(27.56)	(0.72)	(0.84)	(0.98)	(1.08)
$\%Sec$	−0.20***	−0.41***	−0.43***	−0.38*	−0.36***	−0.71**	−0.17	−0.12	−0.06***	−0.04***	−0.05***	−0.06***
	(0.04)	(0.10)	(0.15)	(0.21)	(0.14)	(0.29)	(0.40)	(0.48)	(0.01)	(0.01)	(0.02)	(0.02)
$Bubble$	48.25***	109.30***	36.19	3.49	22.46	115.18**	−62.06	−205.10***	5.96**	3.24	−1.43	4.01
	(9.26)	(22.83)	(29.78)	(39.95)	(23.24)	(51.70)	(50.26)	(52.71)	(2.34)	(2.65)	(3.16)	(3.47)
Constant	92.56***	203.46***	296.29***	404.53***	292.42***	684.28***	708.36***	726.48***	6.77***	−4.40***	−5.35***	−3.98*
	(6.21)	(14.48)	(21.67)	(31.24)	(19.09)	(39.72)	(54.53)	(60.42)	(1.46)	(1.68)	(1.99)	(2.15)
Observations	4,186	3,909	3,534	3,194	4,143	3,840	3,456	3,103	4,177	3,887	3,506	3,162
R-squared	0.13	0.12	0.10	0.10	0.07	0.10	0.07	0.06	0.08	0.04	0.03	0.04
					Panel B							
L	26.23***	68.60***	75.89***	75.48***	41.51***	171.67***	125.69***	42.61	3.94***	6.00***	3.11**	4.85***
	(5.07)	(11.72)	(16.29)	(21.35)	(14.75)	(30.27)	(35.99)	(36.47)	(1.30)	(1.47)	(1.58)	(1.71)
Observations	4,186	4,186	4,186	4,186	4,143	4,143	4,143	4,143	4,177	4,177	4,177	4,177
R-squared	0.13	0.12	0.11	0.10	0.07	0.09	0.07	0.06	0.08	0.04	0.04	0.04

Table 8: "Initiating coverage" reports released by book runners

This table reports mean and median underpricing (the percentage change between the offer price and the first trading day closing price) of a sample of 50 early movers and 50 late movers that are randomly picked among firms that were taken public by a single book runner between 1999 and 2012. For each firm, "initiating coverage" reports released by the book runner is obtained from Investext. Early movers are firms that go public within the first two quarters of a rising IPO cycle, and late movers are those conducting an IPO during the subsequent quarters of the rising IPO cycle. The columns titled "All - ex 1999" exclude issuers that went public during the hot market of 1999-2000.

	All			All - ex 1999			Early movers			Late movers		
	mean	median	count	mean	median	count	mean	median	count	mean	median	count
Panel A: Early-mover advantage mentioned?												
No	8.31	4.21	72	7.99	3.08	64	10.29	7.78	32	6.73	2.00	40
Yes	44.75	23.54	28	21.45	18.71	16	56.52	28.70	18	23.57	18.40	10
All	18.51	8.14	100	10.68	5.73	80	26.93	10.32	50	10.10	3.93	50
Panel B: Difficulty finding comparables mentioned?												
No	13.79	7.74	81	10.39	5.73	66	18.26	8.14	40	9.43	6.61	41
Yes	38.66	10.86	19	12.04	5.89	14	61.62	14.77	10	13.14	2.00	9
All	18.51	8.14	100	10.68	5.73	80	26.93	10.32	50	10.10	3.93	50

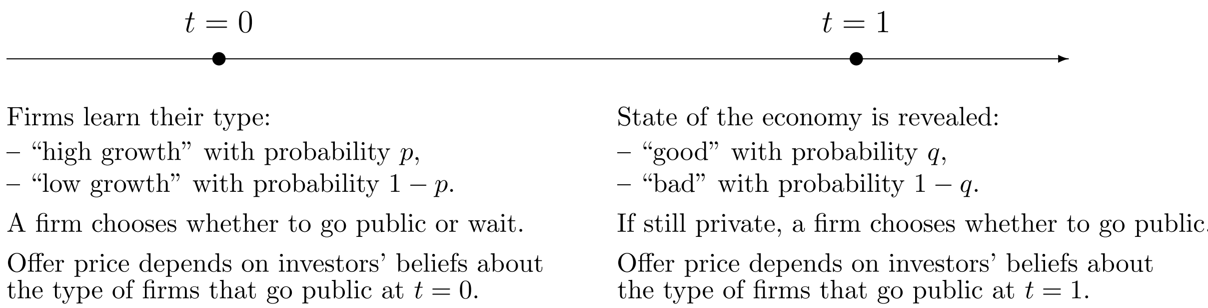
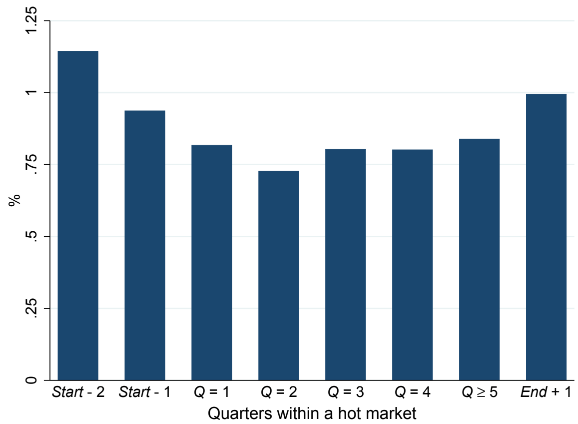
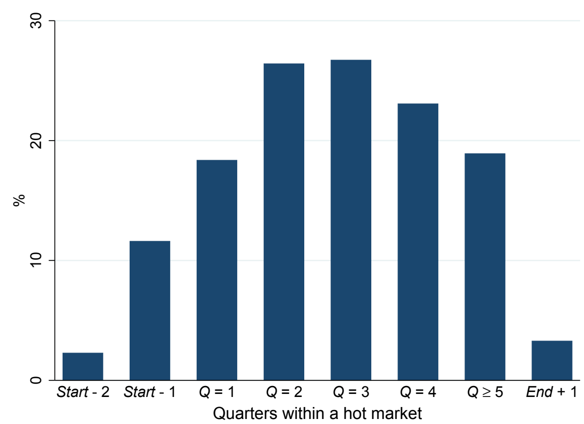


Figure 1: The timeline of the IPO timing game.



(a) Market volatility



(b) Market run up

Figure 2: Changes in economic conditions around a hot market.

For each quarter, market volatility is the standard deviation of daily returns within that quarter, and market run up is the return cumulated over a year until the end of the quarter. The bar charts show the average market volatility and the average market run up for each quarter of a hot market and for quarters that precede and follow the hot market. Value-weighted index of NYSE/AMEX/NASDAQ stocks is used in both panels.